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ABSTRACT

This publication, which consists of selected readings from volumes 1-5 of The American Journal of Distance Education, is designed for corporate and military trainers who want research-grounded materials that can be used in programs that train trainers. The 12 articles, whose authors come from the army, navy, and airforce, from universities and major corporations, represent various media, different types of organizations, and different processes in the teaching-learning relationship. The articles include: (1) "A Historical Overview of Telecommunications in the Health Care Industry" (Joseph S. Anderson); (2) "Learning from Teletraining" (Allen G. Chute, Lee B. Balthazar, and Carol O. Poston); (3) "Use of Interactive Television for Outreach Nursing Education" (Marilyn B. Major and Donea L. Shane); (4) "A Fourth Generation Distance Education System: Integrating Computer-Assisted Learning and Computer Conferencing" (Allan C. Lauzon and George A. B. Moore); (5) "A Selection Model and Pre-Adoption Evaluation Instrument for Video Programs" (Carla Lane); (6) "Business, Education, and Distance Education" (Stephen Murgatroyd); (7) "Design Considerations in Selecting Teleconferencing for Instruction" (Ellen D. Wagner and Nancy L. Reddy); (8) "Whose Job is Teleconference Reception?" (Shirley Davis and Charles S. Elliot); (9) "A Navy Video Teletraining Project: Lessons Learned" (William L. Maloy and Nancy N. Perry); (10) "Effectiveness of Distance Education Approach to U.S. Army Reserve Component Training" (S. Delane Keene and James S. Cary); (11) "Empowering the Learner through Computer-Mediated Communication" (Lynn E. Davie and Rosalie Wells); and (12) "Effectiveness and Costs of Distance Education Using Computer-Mediated Communication" (Ruth H. Phelps, Rosalie Wells, Robert L. Ashworth, Jr., and Heidi A. Hahn). Three interviews are also presented: "Speaking Personally with Colonel William A. Wojciechowski" (Phil Savarise); "Speaking Personally with Kathryn Porter and William Mason (Aetna Life and Casualty)" (Dawn Middleton-Paradise); and "IBM's View of Distance Education: Speaking Personally with Susan Leslie, Dick Scott, and James Tomsic" (Lauren Lukert). Most of the papers list references; approximately 200 references are contained overall. (KRN)

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Distance Education for Corporate and Military Training

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READINGS IN DISTANCE EDUCATION **NUMBER 3**

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Distance Education for Corporate and Military Training

Edited by
Michael G. Moore

Number 3 in the series ***Readings in Distance Education***

American Center for the Study of Distance Education
The Pennsylvania State University
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Preface

The continued growth in interest in distance education within the training organizations of corporations and the armed forces has led to numerous requests for research-grounded study materials that can be used in "Training the Trainers" programs. I am aware also that when trainers approach policy makers in their firms and departments with a claim that distance education is a viable training approach, it would be helpful to have documentation of what kinds of research and practice is occurring in the training sector. For these reasons I have selected this set of readings from Volumes 1 to 5 of *The American Journal of Distance Education*. It is also my hope that by focussing in this way on corporate and military training I will encourage trainers to come forward with more information and also to undertake research both formal and informal. All kinds of information and ideas are needed in this exciting field, and a wealth of experience is waiting to be reported. In this volume, I have selected articles to represent various media, different types of organizations and different processes in the teaching-learning relationship. Authors come from the army, navy and air force, from universities and major corporations. I am grateful to them all for their pioneering work, but most especially for their readiness to take time to analyze and to report that work.

Michael G. Moore

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A Historical Overview of Telecommunications in the Health Care Industry

Joseph S. Anderson

Rapid advances in health care and related technology have mandated staff development through continuing education programs for health care professionals. Consumers expect competent, knowledgeable practitioners. Administrators conscious of costs, particularly for nonrevenue-producing programs such as staff development, are acutely interested in the return on their investment. Therefore, the critical factor in the determination and selection of a specific program and medium in which it is presented relates to its impact on practice. The task of providing cost-effective continuing education to institutionally-based personnel is further complicated by triple shifts, rotating shift practices, and part-time personnel. In such a setting, it is necessary to develop a flexible format to meet the needs of adult learners, given their assigned patient load, working hours, and unanticipated emergencies. If a program is to be effective, therefore, it must be readily accessible in the work place, available whenever employees' workloads permit and be of limited duration. In short, the learner must have some control of the scheduling.

In a parallel manner, recent advances in telecommunications have resulted in the rapid growth of alternative electronic communications media. With the advent of closed-circuit, low-cost satellite earth terminals, communications networking has been given a new dimension. Organizations and institutions, such as hospitals, are positioning themselves to establish standards and methods of resource sharing among producing networks. Guidelines are "on the drawing board" for cooperative arrangements that would create a "network of networks."

The purpose of this article is to present an overview of the evolution and application of distance learning via telecommunications in the health care industry. The article will address the problems associated with the rapid growth of communications technology and the slower growth in the ability of users to produce and distribute programming to health care practitioners.

Telecommunications is used in this paper to mean a communications medium that allows groups and/or individuals to interact from distant multiple locations using telemetric technology such as audio (telephone), audiovisual (satellite-transmitted television and videotaping), and computers (electronic data transmission). The principal reasons for employing the telecommunications media in delivering adult and continuing education are related to cost and availability. Distance learning through satellite-transmitted television has demonstrated that it can help health care professionals in many ways, such as: (1) providing on-site continuing education; (2) creating an opportunity for systematic needs assessment; (3) reducing the costs of quality care and expenses associated with continuing education; (4) enhancing the immediacy of continuing education; (5) facilitating program evaluation; (6) promoting on-site applications of program content; (7) facilitating health care team building; and (8) providing an opportunity for live interaction between content experts and program consumers.

Although traditional methods of instruction have a number of advantages, such as face-to-face interaction, shared participation, spontaneity, and control over attendance, literature suggests that the use of telecommunications as a medium for adult and continuing education, particularly in the health care industry, is equally effective.

Telecommunications and Slow-Scan Video

There is no question that teleconferencing and slow-scan video have opened up new frontiers in continuing health education. Distance education in Ontario, for example, started in 1982 when the Toronto General Hospital, in cooperation with the Royal College of Physicians and Surgeons, purchased a twenty-port audio teleconference bridge (Pipher 1985). The bridge is the communication center and the ports are the links with distant hospital locations or sites participating in a continuing education program. The system has the capacity to link sixty sites, with nurses being the heavy users of the system. The programs are produced live and are designed to meet the needs of different health professionals. During its short history, the project has more than proved its value. An average of eight programs are offered weekly at a cost of $20 to $30 per one-hour program plus long-distance charges for the telephone hookup. Each hospital that signs on as a regular participant selects a staff member as site coordinator. This system has also opened up opportunities for direct consultation between health professionals in different locations while providing the opportunity for demonstrations of professional expertise. Through slow-scan video, which permits the transmission of motionless television pictures over ordinary telephone lines, the learning process can be enhanced. Although the slow-scan video was originally designed for x-ray transmission, hematologists have used this technology to transmit pictures of blood slides, and it has been used for patient education. In addition, slow-scan video has been used in the telemedicine project for social therapeutic purposes (allowing hospitalized patients to call home and see their families).

Telephone conferences particularly have gained increasing popularity in an age of health care staffing shortages. For example, the Teleconference Network of Texas has become the vehicle for delivering up-to-date education immediately to the smallest and most remote hospitals throughout Texas (Graham and Masters 1982). Similar to telemedicine in Ontario, the Teleconference Network of Texas participant sites select a conference coordinator who acts as liaison with the Office of Continuing Education Services. The coordinator also distributes study material, sets up slides, and sees that attendance sheets are signed for credentialling. One of the benefits of this teleconferencing to participants is the ability to learn from and consult with well-known and highly-respected instructors.

One of the most widely acclaimed teleconferencing systems in the country has been the University of North Dakota's Educational Telephone Network (ETN), which includes more than 45 reviewing agencies in 30 geographic locations (Cooper 1979). The impetus for this network grows out of an ever-increasing number of nurses seeking ways of completing the baccalaureate degree. Since ETN was designed as a two-way communications system which transmits courses for credit and instructional programs via private telephone lines, individuals at home may also participate by means of a conference call to "bridge-in." ETN organizers found that by the end of a course most participants were able to participate on-line, and the presence or absence of the lecturer on-site did not seem to be a significant factor in terms of learning. Although some participants have indicated a preference for having content presented through the medium of video as well as audio, the general consensus has been one of appreciation for the opportunity to obtain educational offerings, especially those for academic credit, with a minimum of disruption of families and working schedules. The advantages cited by participants in ETN have been the access to education, the small groups for laboratory practice, the relaxed atmosphere, the hours of the course, and the knowledge and experience shared by the instructors.

An example of the use of the telephone to expand continuing education opportunities for clinical laboratory personnel is in operation at six locations in northwest Illinois (Parochko and Miller 1984). This program is an outgrowth of cooperation and coordination among three internal and two external units of the University of Illinois. Each course segment is delivered by a nationally recognized figure. The presenters are introduced to the audience by including a still photograph as the first slide of the presentation. Telelectures last approximately 35 minutes; time is allocated for site roll call, introductory remarks, lectures, clarification, and question/

answer sessions. Program participants have been receptive to this instructional strategy.

Teleconferencing via telephone can be arranged through a statewide system or through regional systems. For example, the Association of Operating Room Nurses has been conducting lectures with existing systems in several states since 1978 (Cooper 1979). The presentations are transmitted from any location through a portable unit that contains a volume control, two microphones, and a telephone. This unit plugs into any telephone outlet and has high-quality speakers designed to transmit to large groups. At the receiving end, there are multiple microphone units for participants. All listening stations have the same equipment.

Telecommunications and Satellite Broadcasting

As early as 1969, the Pan Pacific Education and Communications Experiment by Satellite, established by the University of Hawaii, utilized one of NASA's weather satellites for two-way information sharing (Rasmussen 1982). It was the first regularly operating international education satellite network in the world. The content of programming has been directed at nurses.

Satellites can serve as a distribution system for continuing education and as an alternative to seminars. The system improves access and reduces travel costs and time away from work. There have been both successes and problems in using satellite communications. On the success side, the American Hospital Association (AHA) has used satellite technology to broadcast portions of its annual conventions (Houy 1983). In addition, AHA has brought "ad hoc" broadcasts to hospitals via live single program presentations using satellites.

Another success story is the American Dietetic Association's (ADA) programming using satellite technology. ADA has been one of the pioneering organizations in the application of satellite television broadcasting for continuing professional education. The ADA started experiments with satellite delivery in 1976 using the NASA satellite (Nanberg 1981). It found that member interest was high and that the medium was considered as effective as traditional instruction. The ADA experience suggests that organizations able to do satellite broadcasting on a cost-recoverable basis should have a large and homogenous membership to ensure high registration, and should plan on high registration fees. However, ADA found that some types of educational functions are not well-suited to this medium. Skills development, which generally requires small group work with close supervision, is one example. ADA has demonstrated that a network probably never will be able to reach much more than half the membership in a cost-effective way. This suggests edited videotaped versions of broadcasts be made available as self-study kits for sale and rental.

The rapid growth of continuing nursing education prompted the University of Maine School of Nursing in 1974 to develop a statewide telelecture network. The Telelecture Project, as it is called, is a series of educational offerings constituting a total program delivered via a network that links the Bureau of Continuing Education for Nursing to hospitals and health care facilities throughout Maine (Rost, Barber, and Thomas 1981). Nurses have an opportunity to participate in seven courses each semester. Each course is 10 to 20 hours long and usually meets one hour each week. Evidence has shown that the degree of student control over the learning process and the complexity of the communications system may be more important in determining effectiveness than the particular medium itself; there was no evidence to show that telelecture is more or less effective than any other type of telecommunications medium. Also, the Telelecture Project found that the more education participants have, the more likely they were to continue taking telelecture courses.

On the negative side, there have been some problems associated with the use of satellite technology (Nanberg 1983). For example, there appears to be a limited demand for national programs. One of the reasons for this limitation is that every hospital has a strong self image of uniqueness and an equally strong desire for as much local control over program content as possible. Also, there is a strong desire on the part of hospitals to preview every program. A third problem that has been experienced is that of scheduling broadcasts in different time zones. The fourth and most challenging problem relates to the variety of audiences and their different levels of sophistication. AHA has concluded that we have not yet seen the right combination of services or the right combination of uses of technology to foster the creation of a national network. While continuing education and current medical education are the most likely applications of satellite technology, there are several other applications that may prove important. Perhaps the one potential service that may pull much of this together is that of data transfer; for example, demographic data and economic modeling information could be transmitted on an interactive basis via satellite technology.

Other Media

The 1980s have seen the establishment of four cable health networks of interest to hospitals, which were intended to make health-related education cheaper and more widely available (Linder 1985). The Cable Health Network runs a commercial, consumer-oriented cable network. Another, the Hospital Satellite Network, offers full lines of entertainment, patient information, community outreach, professional education, and videoconferencing. A third, the American Hospital Video Network, offers only continuing professional education. A fourth, the American Network, has now discontinued specialized health programming for patients and professionals (Carubo 1981, 1982).

Video-teleconferencing facilitates the use of a variety of presentation aids, such as slides, graphics, audio and videotape models, and specimens. When used properly these aids can be as effective as, or even superior to, a classroom situation. Videotaping makes it possible to accommodate those who did not receive the original broadcast, allows for reinforcement of learning, and allows presenters to review their presentations (Kneedler 1978).

Interactive video is a synthesis of computer and video technology that actively involves the learner in the instructional process. The video materials may be viewed in a traditional way or may be randomly retrieved and mixed with computer-generated text. An example of interactive video has been demonstrated at the California State University through its Instructional Television Fixed Service (ITFS) (Graham 1982). This system, which broadcasts to 15 learning center sites throughout the northern California region, has two-way communicators. Similar systems are also available to home viewers through their cable system. The ITFS model was developed to provide a traditional broadcast program yet be adaptable to utilize the best features of computer-controlled video disk and computer-generated text. The ITFS is currently utilized by the Statewide Nursing Program to offer a baccalaureate degree in nursing in selected hospitals throughout California. Over 700 nurses are participating.

Conclusions

Meeting staff development needs of health care personnel in the health care industry is both challenging and complex. Thus, for learning and information exchange to be effective, it must be interactive and readily accessible internally, as well as externally to the work place. For the program planner, the critical factor in the determination and selection of a specific program and medium relates to its impact on practice; i.e., the development of a flexible format to meet the needs of adult learners given their assigned patient load, working hours, and unanticipated emergencies.

Characteristics of adult learners influence the success of continuing education activities. Acceptance of teleconferencing as a medium of continuing education for health care professionals depends on a variety of factors. For example, the effectiveness of a particular delivery system varies from learner to learner.

Geographically, teleconferencing has a high incidence of use in the Midwest. Successful teleconference systems providing continuing education for nurses exist in Ohio, Minnesota, Oklahoma, South Dakota, Iowa, and Wisconsin. An overview of the health care industry's application of the techniques of distance education suggests that organizations that will be able to do satellite broadcasting on a cost-recoverable basis will be those that have a large homogenous membership to ensure high registration fees.

Satellite broadcasting is particularly attractive for national associations. They can use it to compete effectively with local providers of continuing education who have neither the resources nor the national constituency to support broadcasts. Some experts believe that we have not yet seen the right combination of services nor the right combination of uses of the technology to drive the creation of a national health care network.

Satellite technology can serve as a distribution system for continuing education and as an alternative to bringing people together in seminar form. It also improves access and reduces travel costs and time away from work. Evidence has shown that the degree of student control over the learning process and the complexity of the communication system may be more important in determining effectiveness than the particular medium itself.

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Learning From Teletraining

**Alan G. Chute, Lee B. Balthazar,
and Carol O. Poston**

This article presents a retrospective look at five years of learning from teletraining, including what the students have learned and what the distance educators have learned regarding the design and management of teletraining systems. Research and development are conducted at the National Teletraining Center in Cincinnati, Ohio. The mission of the NTC is to investigate, develop, and demonstrate innovative applications for state-of-the-art telecommunication technologies. The center is the AT&T teleconferencing showcase for information movement and management, not only within the corporate business and training environment but also within the traditional educational setting. The National Teletraining Center works closely with AT&T Bell Laboratories, leading universities, and nationally-recognized experts to research problems and develop creative solutions for every teletraining need.

Teletraining is defined as a complete system that integrates the planning, delivery, and management of training by using a combination of information technology and teleconferencing services. The delivery media used are audio, audiographic, and video. Audio teletraining uses conventional telephone lines that are networked together to provide an interactive, shared-audio space between instructor and students. Audiographics provides users with the capability to interact with one another through two-way voice and graphic communication and to share images simultaneously on high-resolution, color monitors. The screen images can be annotated with the aid of graphics tablets, which further enhances the participants' capability to interact spontaneously with one another.

Video technology provides several modes of delivery. Broadband communication channels enable all locations to see live, full-motion video from the originating site. Newer technologies will enable two-way visual and two-way audio communication between all locations connected by high-speed, high-capacity digital lines. Video, together with audio and audiographic technology, make up a continuum of delivery options that can provide either very basic (audio only) or very sophisticated (full-motion video) levels of presentation.

The research and development effort at AT&T is geared toward increasing our understanding of the various psychological, sociological, ergonomic, and environmental factors involved in teletraining and toward improving our ability to effectively manage the distance learning environment. The projects described in this article represent part of an overall programmatic research effort to optimize and proliferate specific teletraining technologies within the broader context of distance education. Many of the findings and recommendations to be discussed have been implemented in the design, delivery, and management of AT&T courses. Those that are nonproprietary are shared with clients interested in the deployment of effective teletraining systems.

Instructional Effectiveness

The instructional effectiveness of teletraining has been demonstrated at AT&T, where several modes of delivery and their respective student achievement outcomes were compared (Chute, Bruning, and Hulick 1984). Two intact groups of students were presented with either traditional face-to-face classroom instruction or remote teletraining instruction. The teletraining mode utilized an electronic conference board, two-way voice communication, and interactive graphics capability. Transmissions over standard telephone lines linked instructors with their distant students. The course content and the amount of instruction were held identical for both groups. The results showed that while pretest scores between the two groups were not found to be significantly different (t=1.73, df=20), the posttest scores of the teletrained group were significantly higher than those of the traditional classroom group (t=6.24, df=20). Students appeared to learn from the teletraining mode as well, if not better, than they did from the face-to-face mode.

An issue related to how well students learn in a teletraining mode concerns how well they accept the experience. Internal students at AT&T were asked to compare the effectiveness of teletraining with the effectiveness of face-to-face instruction. Surveys were obtained over a six-month period from 329 students enrolled in forty-five face-to-face classes and 590 students enrolled in thirty-two teletraining classes. Students from each group were asked to respond to questions that pertained to course relevance and design, and to the overall quality of instruction. No significant differences were found between the responses of the two groups on any of the response categories. This suggested that students perceived courses delivered via teletraining and traditional, face-to-face modes as being equally effective.

This finding was supported more recently in a study which assessed how clients responded to newly developed courses and to teletraining in general. The researchers reported a high level of acceptance and student satisfaction with the teletraining mode of delivery (90 percent), and a high level of satisfaction with the content of each course.

In addition, they reported that student satisfaction was related to: (1)

whether the content was relevant to their jobs and challenging enough for their level of expertise, (2) whether the cost for teletrained courses was less than the cost for face-to-face courses, (3) whether the transmitted visuals were of broadcast quality, and (4) whether the courses were interaction-oriented. They also found that clients thought short teletraining sessions (one-half to a full day), conducted in full-motion video at a site near their office, were very appealing.

Related to instructional effectiveness and learner acceptance is the concept of instructional appeal. Traditional attempts to improve training tend to focus on effectiveness, efficiency, and affordability as the critical areas of high quality training. According to a study in progress, those areas are not sufficient to ensure that the training will be well received, or that the trainees will return in the future. In other words, "better — faster — cheaper" is not good enough. A fourth factor — "appeal" — should also be considered, especially in a business environment where training success is due, in part, to how much satisfaction the client anticipates from the experience. While there seems to be little doubt that teletraining can provide effective, efficient, and affordable alternatives to face-to-face training, there continues to be some "learner" resistance to teletrained instruction.

The researchers argue that the factors related to the appeal and delivery of training should be identified and addressed so the receptability of teletraining can be increased. In order to identify these factors, the appeal of the three modes of instruction is currently being examined. Preliminary results based on observational, questionnaire, and interview data suggest that teletraining can be made more appealing by focusing attention on the instructional elements, the social needs, and the innovation-adoption aspects of teletraining. Specific ways to improve the appeal of teletraining are forthcoming. By implementing these strategies into the design and delivery of teletrained instruction the NTC plans to increase the level of gratification that learners experience in teletraining.

Other studies have examined students' concerns, experiences, expectations, and feelings in a day-and-a-half long teletrained course using naturalistic inquiry. Results show: (1) what students experience in teletraining is influenced by their prior needs and expectations, (2) among their major concerns is the feasibility of teletraining applications within their organizations and the cost of both equipment and services, (3) students believe the on-site coordinator is critical to the success of a course, and (4) proper instruction and guided practice are essential to removing the "myth and magic" from teletraining. Instructors should maintain an awareness and sensitivity to the concerns of students so as to better meet their needs.

Along similar lines, a study was conducted to determine to what extent learners in teletraining attribute their success or failure to the instructional design and delivery medium and to the learning environment. The results showed that students attributed mood, effort, ability, attitude, a need to do well, the quality of materials, the instructor, and the design of instruction to their ability to learn successfully in a teletraining environment.

Cost-Benefit Analyses

Teletraining has produced significant cost-benefits for AT&T over the past several years. Major savings have been realized through the teletraining of internal courses, one-hour update programs, and special internal seminars (Chute, Hulick, and Palmer 1987). In effect, the costs previously incurred from travel expenses and lost productivity were avoided by using the teletraining medium. The research conducted in this area provided evidence that teletraining is a cost-effective alternative to face-to-face information delivery.

Since the cost of delivering instruction is an important consideration in many training programs, the NTC staff has recently developed a spreadsheet model on cost-efficiency that can assist clients in selecting a medium or media suited to their budgets and needs. The model incorporates charts, figures, and formulae based on industry-accepted values or values determined by experts in the field of instructional technology. Figures provided by the client are evaluated on two levels of detail — macro and micro. The macro level compares the basic costs of implementing six delivery options: face-to-face, programmed instruction, computerbased education, audio teleconferencing, audiographic personal-computer conferencing, and full-motion video. Included are the annual cost figures for equipment, maintenance/updating, trainees, instructors, support staff, and delivery of instruction. The micro level reveals each individual cost factor, the formulae used to derive the cost figures, and the actual dollar amounts used in the computations.

To demonstrate the effectiveness of the model, a hypothetical situation was developed in which 2,000 people were expected to receive eight hours of training within a one-year period. By incorporating various details and figures of the particular training situation, a total cost figure was computed and the most cost-efficient method of instruction was identified. The results indicated that all technologies listed above were more cost-efficient than face-to-face delivery. It was concluded that, if an analysis proceeds only to the point where the initial costs of equipment and course development are determined, then any form of instruction delivered by advanced technologies would naturally appear to cost more. However, by factoring in cost-savings figures, it can be shown that the actual cost of instruction utilizing advanced-delivery technologies is lower than the face-to-face mode. This and other cost-benefit studies conducted by the National Teletraining Center provide evidence that teletraining is an economical alternative to face-to-face information delivery.

Course and Curriculum Development

While many of today's corporate managers are faced with the responsibility of training a widely dispersed work force, a large number are neither acquainted with the distance education technologies available today nor familiar with the skills and knowledge required to put the technology to use. In an attempt to determine what programs were available to professionals needing training in distance education, a dozen leading universities and corporations were studied to assemble a profile of what was currently being offered around the country.

The research found that: (1) universities offered "skills" courses in instructional technology (IT) while corporations did not; (2) from a project-management and system-integration perspective, both universities and corporations offered courses in instructional telecommunication (ITS) systems; (3) general computer-based education (CBE) courses were offered at some universities while select CBE courses were offered at both universities and corporations; (4) overall, very few CBE and ITS courses were conducted from a design and delivery perspective; and (5) most IT courses surveyed were oriented toward the middle ground between high-tech and low-tech and between a "skills" emphasis and a "management" emphasis.

In conclusion, the researcher said that there were no programs (academic or corporate) around the country specifically oriented toward teletraining in a corporate environment, and that professionals had to obtain most of their knowledge and skills through on-the-job training, or from seminars and private consultants. A follow-up study is planned for analyzing the responses of thirty business professionals located nationwide to determine what types of skills, knowledge, and media are needed in their teletraining applications. From these results will follow additional studies to further define the specifications for a complete teletraining curriculum.

Three studies at AT&T have identified several factors that were critical to the success of teletrained courses. Based on observation, interviews, and surveys from five different teletrained courses, the researchers identified several areas of critical importance. These areas concerned: (1) client characteristics, (2) course design-development considerations, (3) instructor presentation skills, (4) media limitations, and (5) on-site coordination activities. Within these areas the authors presented over thirty-seven detailed recommendations to guide the development of future teletraining courses and to outline critical areas needing further investigation. This study, when combined with forthcoming results on "appealing teletraining", should help to further refine the process by which courses are designed and delivered for distant students.

Instructor Competencies

AT&T has a strong interest in maintaining a high level of instructor effectiveness in its training programs. However, as can be expected, instructors can differ widely in the way they approach similar instructional tasks. To identify the common attributes that expert teachers share, an analysis of top AT&T instructors was conducted and researchers were able to develop a competency-based model that provided a basis for instructor selection, evaluation, career management, assignment, and training. Expert instructors were found to possess skills or knowledge in these areas:

- Basic learning theory,
- Organizing/managing materials and learning environment,
- Managing course structure and organization,
- Administration/evaluation,
- Verbal and nonverbal presentation methods,
- Responding to trainees,
- Questioning techniques,
- Coordinating group activities,
- Subject matter expertise,
- Teaming, and
- Teletraining skills.

The model was validated with responses obtained from fifty-seven managers, instructors, and instructional technologists. Based on their work AT&T has since implemented a six-to-nine month, instructor-certification program that teaches people how to perform more effectively as instructors. The program is geared to refining instructors' skills periodically over a thirty-six month period.

More recently, a teletraining-competency model was developed that identified two main categories and six subcategories of skills related to competent teletraining performance. In general, the model prescribes that instructors should be competent in the use of evaluation and management techniques, objectives, activities, and media. The model will be validated, then implemented, in future teletraining courses.

Media Attributes

Applied research is generally geared toward finding cost-effective solutions to practical problems. Center researchers investigate ways that clients can get maximum use out of their investments in highly sophisticated teletraining technologies. One of NTC's objectives is to generate information that will get technology up and running as quickly and as smoothly as possible. Audiographics is the state-of-the-art technology that lies at the heart of AT&T's teletraining system. To identify what features users of audiographic systems want in an ideal system, a number of instructors and technologists were surveyed. From their responses emerged ten critical features including a desire for high-quality audio, high-resolution imagery, an annotation capability, and a key-pad response capability. Future designs should incorporate these features to make the devices easier to operate and to improve the system's overall effectiveness.

Along similar lines, researchers were also interested in identifying which audiographic control functions teletrainers considered critical to their online teaching success. In a study with twelve expert teletrainers, fourteen such functions were identified from a list of twenty-four and then ranked in order of importance. These findings were further supported by written responses to the instruction, "List five of the most critical features you would require as keys on an audiographic peripheral device." The nominations for various functions were tallied, then ranked in order of magnitude. A correlation coefficient was computed between these and the fourteen function items. The results indicated a strong, positive relationship between the two rankings ($r = .86$).

In terms of psychological characteristics, the respondents' collective views about audiographic interfaces suggested guidelines for future audiographic designs. For example, respondents indicated that only a handful of functions were necessary in order to make them comfortable with instructing online but that these handful were critical to their teletraining success. In addition, respondents said they preferred functions that facilitated quick and simple screen control over functions that were more elaborate but cumbersome to use. In general, when online, instructors wanted an interface that helped reduce the already complex nature of teletraining rather than contribute to it.

Future Research Directions

Today, educators and corporate trainers are faced with the challenge of providing quality educational programs for an ever-increasing number of students who are globally dispersed. The information age and the high rate of technological change have opened new job opportunities for millions. There is a need for more training and retraining to prepare people for the work place.

One potential solution is to develop a student-centered, technology-based, information management and dissemination system (IMDS) that will provide users with the ability to access automated, educational databases. IMDS, a joint venture between AT&T, Indiana University, and other leading institutions, is a step toward technology that is easy to use, easy to support, and easy to manage. The information system should make available online databases, backed by support and documentation, which can be accessed through personal computers and terminals with natural-language queries and commands. In addition, the system should be able to tell what training programs are available through computer-based training, teletraining videodisc, or lecture, and should also be able to list course schedules, instructors, and training locations when necessary. Such a system should also have the capability to assist users in narrowing or broadening the search for information and should have the capability to monitor user-patterns (e.g., number of times help was needed during a session). Knowing how users interact with the system will be helpful in the development of future courses, expert systems, and other pertinent information resources.

The partnership between AT&T and academe offers educational researchers a unique opportunity to engage in programmatic research to improve the effectiveness and efficiency of technology-based learning systems. The research studies sponsored by the partnership are programmatic in the sense that, over a period of years, the individual studies will weave a fabric of sound instructional research on which the development of sophisticated learning systems can be based. The findings of each study will be tied to the development of an integrated, instructional-communications model.

Research projects need to be conducted that will answer critical questions for the development of the IMDS strategy. The following research projects have been identified as important topics for successful development and implementation of IMDS:

- Natural Language/Artificial Intelligence,
- Adaptive Learning Strategies,
- Adaptive Testing Strategies,
- Msg Design Attributes for Emerging Technologies,
- Student Motivation Enhancement, and
- Training Effectiveness Models.

Several of these projects have already begun and various teams have been collaborating on the planning and execution of the much-needed research.

The overall plan calls for the findings from the research to be disseminated through a variety of technology-based systems. Initially, a teletraining network will be used to share ideas and information among faculty from academic institutions and AT&T organizations. Later, information modules will be developed for the stand alone, Integrated Learning System for the Future, which is currently in the initial stages of development. The system will integrate computer-based training, digital imagery, laser disk, and teletraining into one system driven by an AT&T personal computer.

Additional research is required in a number of other areas to further refine the teletraining application and to keep pace with technological developments that enhance the capabilities of interaction in a teletraining system. The promise of a "systemic" approach to instructional design, delivery, and evaluation offers an interesting direction when contrasted with the more traditional "systematic" models currently being used in corporate training environments. The AT&T National Teletraining Center will continue to expand its effort in a variety of research areas in an attempt to understand more clearly the types of problems and benefits that are involved in teletraining applications.

Note

The research reports from the other studies mentioned in the article are AT&T proprietary information and cannot be released in their original form to the public.

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Use of Interactive Television for Outreach Nursing Education

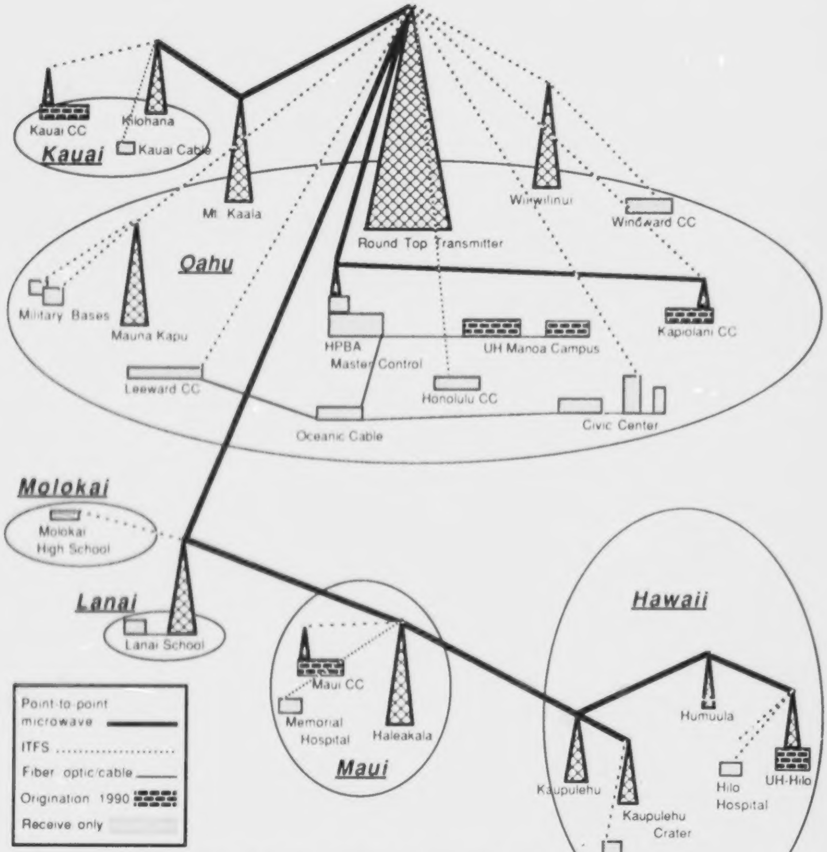
Marilyn B. Major and Donea L. Shane

Outreach education provides an opportunity for students located far from universities to pursue higher education. Nursing schools across the United States have utilized outreach education to provide working Registered Nurses (RNs) with a means to obtain the Bachelor of Science in Nursing (BSN) degree. The University of Hawaii at Manoa (UHM) and the University of New Mexico (UNM) have used this approach to deliver courses to RNs living in remote communities. In the UNM RN-BSN completion program, students receive a BSN degree. At UHM, the RN students are awarded a BS degree with a specialty in nursing. In this article, the terms RN-BSN completion program refer to all RN-completion programs leading to a Bachelor's degree. This article describes the combined experiences of these two schools and discusses the characteristics, benefits, drawbacks, faculty/student implications, and unresolved issues.

Outreach BSN Completion Programs

Hawaii Interactive Television System (HITS) currently broadcasts outreach courses for RNs in BSN degree completion programs to locations on Oahu distant from the main campus at Manoa and the Neighbor Islands. Most of the HITS sites are located in community college facilities which are a part of the state-wide university system. (See Figure 1.) The University of New Mexico College of Nursing has offered its courses via instructional television (ITV) at 20 sites throughout the state, and plans to continue offering at least one course per semester if adequate funding can be secured. The New Mexico Hospital Association facilitated the establishment of some of the sites in rural hospitals while community colleges house the remainder of the receive sites. This demonstration project, which generated approximately 400 enrollments over the first ten courses, originates the telecasts from the Instructional Television Department at UNM's main campus, in Albuquerque; receive sites are located between 50 to 200 miles away.

Both UNM and UHM view outreach RN-BSN degree completion as one of their most important missions. Each of these programs strives to increase the number of BSN-educated RNs, resulting in well-qualified nursing personnel in rural areas. Due to the acute nursing shortage in both states, these rural based nurses may be irreplaceable health care assets to their small communities. Outreach nursing education allows them to meet their educational goals while remaining in their home communities with families and careers.


Kauai CC
Kilohana
Kauai Cable
Kauai
Mt. Kaala
Round Top Transmitter
Wiliwilinui
Windward CC
Oahu
Military Bases
Mauna Kapu
HPBA
Master Control
UH Manoa Campus
Kapiolani CC
Leeward CC
Honolulu CC
Oceanic Cable
Civic Center
Molokai
Molokai
High School
Lanai
Lanai School
Maui CC
Memorial
Hospital
Haleakala
Maui
Hawaii
Humuula
Kaupulehu
Kaupulehu
Crater
Hilo
Hospital
UH-Hilo
UH Kona
Coast
Point-to-point
microwave
ITFS
Fiber optic/cable
Origination 1990
Receive only

HITS is a four-channel, closed circuit instructional television system intended to deliver live credit courses, meetings, and training among major population centers. Construction funding was first appropriated by the Legislature in 1985. Additional sites are being planned as demand for interconnection grows.

Figure 1. The Hawaii Interactive Television System.

Characteristics of Interactive Television

Instructional television does not intend to deliver programs that are of commercial quality. The classes are not slick, costly, or edited, but frequently feature lively discussions. They are both as spontaneous and as casual as any normal classroom. The instructor can ask questions of students at any site. The students then respond by dialing the correct telephone number. The incoming call is transmitted to the television studio where the conversation is amplified through speakers to all students present in the room with the instructor. The conversation between teacher and remote student can be heard by all students at all sites. Faculty find that true interactivity (genuine exchange of important ideas rather than clarifying assignments or logistical questions) rarely occurs unless the instructor facilitates, motivates, and rewards students for this behavior. The rewards include positive verbal feedback and the assignment of a grade for class participation.

At both schools, the television technical crew are an important part of the teaching team; they become known to students in the receive sites, as well as to those in the studio. When the students initially call the studio, they talk to the technical crew. The students quickly become aware of the importance of the studio crew in solving technical problems at the origination and receive sites.

Due to the topological differences between Hawaii and New Mexico, the ITV systems utilize different transmission technologies, resulting in variation in the distance covered by the transmission signal. UHM's Instructional Television Fixed Service (ITFS) transmissions are limited to specific receive sites which possess special equipment to receive the ITFS signal. The number and location of receive sites are limited and require some commuting on the students' part. By contrast the satellite technology used in New Mexico makes the signal available over most of the continental United States. The signal could be received by individuals with the appropriate dish receiver connected to their television sets. However, the frequency used is an unusual one not generally monitored by the public. Both the Hawaii and New Mexico receive sites are equipped with television sets and dish receivers tuned to the appropriate frequency.

Challenges of Interactive Television Use

The use of ITV in outreach nursing education presents many challenges. These challenges include the funding of the system, the distribution of printed materials, the involvement of students, and the provision of clinical instruction.

Funding of the System. Funding sources seem more willing to buy high quality equipment than to provide for the operation of these systems once they are established. In New Mexico, a substantial portion of the operating costs must be recovered from user fees. Students are charged the usual course tuition plus a "link-up fee," which varies with the total student enrollment in the course. In most of the communities, the RN's employers subsidize either the tuition, the link-up fee or both. To date, Hawaiian users have not been charged a link-up fee.

A related problem in New Mexico was the generation of student credit funding from the state legislature. The UNM College of Nursing was eventually allowed to count all the student credit hours generated by remote students as if they were on-campus students. It seems wise for funding sources to consider allocating both construction and operating funds if this innovative technology is to be utilized more widely.

Distribution of Printed Materials. Careful attention must be given to the distribution and return of printed materials to and from the receive sites. At UNM, the ITV Department assumes responsibility for distributing and collecting "hard copy" items (tests, handouts, syllabi) to and from the receive sites. A commercial, state-wide messenger service provides overnight delivery to any location in the state. This system is fairly expensive and somewhat inconvenient since individuals have to be at the address to receive the materials. UHM installed facsimile machines at the origination and receive sites. Thus, faculty can send materials to students via fax or students can send their homework assignments to the faculty before class begins. The initial investment cost was high, but this system proved to be very efficient and satisfying. At UNM, the ITV unit is the intermediary responsible for pick-up and delivery services. At UHM, the Office of Information Technology and the College of Continuing Education - Community Service assume these responsibilities. This intermediary role requires very careful communication since lost papers are disastrous for both students and faculty.

Involvement of Students. Students taking courses by ITV may feel isolated from main campus students and school activities. This sense of isolation presents many challenges to faculty and outreach coordinators. The authors found that the students at receive sites tend to form cohesive groups, a practice encouraged by faculty members. Students documented this cohesion in written evaluations, and at UNM provided information about it to an outside evaluator. Because this bonding heightens a feeling of group and class membership it should be encouraged and facilitated. Some additional mechanisms to decrease feelings of isolation in students are: 1) sending students the school's student newsletter; 2) faculty visiting each site regularly during the course, and spending time with students over a picnic or potluck; 3) inviting students to the main campus for some particular event; 4) developing a planned series of letters or telephone calls to individual students, so that each one receives a personal contact at least once a semester; 5) showing at the start of each class a short video news brief of events occurring in the school; 6) directing questions to students in particular remote sites, calling them by name and requesting a response; 7) posting photographs in the studio of all students, with their names printed underneath their pictures so that instructors and students begin to put names with faces; and 8) involving students in intersite debates on course topics.

Provision of Clinical Instruction. The provision of clinical practice, so essential to nursing education and the mark of high quality RN-BSN degree completion programs, must accompany the didactic televised courses. This need presents challenges to all concerned because the schools probably have never established relationships with rural agencies. UNM has taken three clinical courses to regional sites, a physical psycho-social assessment laboratory to five regional sites, and Community Health Nursing (two sections) to a total of five regional sites. The usual means of supervising laboratory practice is modified, but the total number of hours does not vary from the usual on-campus course. Financial support for faculty who travel to rural sites necessitates the search for outside funding. A large hospital consortium has donated the services of its master's-prepared clinical nurse specialists (who generally do inservice work in the rural hospitals) to supervise some of the clinical labs. The majority of students are supervised by the teaching faculty from UNM who spend at least two days at each site.

Planning for use of agencies where patient contact occurs necessitates substantial orientation for rural based administrators who may never have worked with schools of nursing. Expectations, contracts, liability issues, supervision policies and benefits to be gained are some of the topics to be addressed in communicating with the administrators of the rural agencies.

Some Modifications of Teaching Techniques for ITV

One of the major benefits of the use of ITV is the resulting examination and faculty alteration of materials which are to supplement instruction.

Use of Different Formats and Colors. Television uses a three inch by four inch format which differs from the more familiar overhead projector format in both size and orientation. Television requires larger margins and uses a horizontal orientation. It may be necessary to redesign teaching materials so that fewer lines appear on any one visual.

At UNM and UHM, instructors found that slides were more discernible in the remote sites if the TV camera focused on the Kodak Caramate projector. A new piece of equipment which feeds the slide image directly into the television camera was also used, if slides conformed to the horizontal orientation. UHM and UNM technicians used a split-screen technique so that a corner of the screen contained a picture of the instructor while the remainder of the screen was filled with the written visual. This technique requires that all the visuals be prepared with a blank in the upper left hand corner.

Experience demonstrates dark black lettering or yellow on a green board, quite large in size, is usually the most readable. Color is very important in assuring that a visual is actually readable at a remote site. The color of the instructor's clothing is also important; blue colors televise especially well.

Using Support Services. Both schools found it necessary to call upon university support services, such as the graphics department, to convert or design supplemental instructional materials for the television format. To be effective on ITV, supplemental instructional materials at UHM required the most dramatic changes. These alterations involved changing visuals from overhead to TV format, decreasing the amount of information on a visual, examining visuals for readability and color compatibility as well as determining if slides conformed to the horizontal TV format.

Problems of ITV Use

The use of ITV in nursing outreach education creates problems. Many of these revolve around the construction of the system, the selection, training and compensation of personnel, the chain of command, legal issues, and system operation.

Choosing Technical Equipment. Most administrators of nursing programs must rely on the expertise of others in equipping studios with technical equipment. Experts from commercial television, university television, and instructional design departments are obvious sources of knowledge and experience. Once the studio is built and equipped, the selection of competent technical support personnel becomes crucial. At UNM, the equipment is operated by the ITV Department which also employs, trains, and supervises the camera operators and directors needed for each televised class. The ITV department also supplies the studio classrooms. At UHM, a new department, the Office of Information Technology, operates the studio and hires competent personnel.

Faculty Selection and Preparation. Various criteria can be utilized in selecting faculty for ITV teaching. Some of the criteria used at these two schools include:

- Knowledge of the content area
- Teaching skills
- Personality traits
- Commitment to outreach BSN education
- Coping skills during system problems
- Healthy attitudes toward ITV
- Eagerness for new knowledge and skills

The authors believe it is important to identify faculty who can empathize with the RN student who works full-time, fulfills family roles, provides community service, and attends university courses. These instructors should be willing participants; no one should be forced or coerced to teach on ITV. Faculty must not use ITV as a forum to deliver personal views since public relations can be quickly damaged when this occurs. Certainly the faculty members chosen as ITV teachers should feel comfortable in the role of innovators and they should be receptive to suggestions for improving their performances in this new medium.

Faculty members need and deserve assistance in modifying their usual techniques and materials to meet the demands of live television. One method used at UHM involved the videotaping of part of a lesson before it was televised on ITV. The instructor reviewed the videotape with a faculty consultant who, in a non-threatening manner, pointed out strengths and areas needing improvement. The entire process of videotaping and critiquing was repeated six or eight weeks later. At UNM, faculty were oriented to television teaching by a member of the ITV department and were supplied with a manual developed for ITV teachers. At both schools, instructors improved dramatically with experience. Most of the instructors, armed with new ideas and ways to become even more effective, were eager to return to ITV teaching. The staff of the Office of Information Technology at UHM or the ITV department at UNM orient the students to the system during the first class of each semester. Faculty members have the responsibility for orientation during the course.

Incentives for ITV Teaching. Remuneration is another concern which arises when selecting faculty to teach on ITV. The means to recognize the extra effort ITV teaching requires evolved in each setting. At UHM, faculty members who teach on HITS for the first time receive release time, while at UNM faculty receive a combination of release time and salary supplement. Regardless of how this issue is resolved, faculty remuneration remains critically important.

Receive Site Personnel. Both schools found it necessary to identify coordinators at the receive sites. In New Mexico, the coordinator was responsible for opening the room, turning on the equipment, establishing the telephone link, handing out materials to students, monitoring examinations, collecting assignments, and making sure that each class was videotaped for individuals who could not attend the live broadcast. During the demonstration project, these individuals were unpaid volunteers, usually supplied by the sponsoring hospitals or junior colleges. Over time, it became clear that these individuals were vitally important to the success of the project and that they needed to be paid. In the Hawaii system, there were both site coordinators and other receive site personnel, all of whom were paid. In any system these commonalties seem important: 1) all tasks and persons responsible for them should be clearly defined before operation of the ITV system begins; 2) everyone must clearly understand to whom problems should be reported; and 3) each individual must perform responsibly, efficiently, and effectively to ensure success. Substantial orientation may be necessary to meet these goals.

Unresolved Issues of ITV Use

Due to the innovative nature of ITV, several issues regarding property rights remain unresolved. One major issue involves ownership and copyright. Can the university sell videotapes of an instructor's lectures to another university or to a commercial cable TV company? Who owns the copyright, the school or the instructor? If copies are sold, should the faculty member receive a royalty? If so, how much, and what proportion, of the royalty is paid to the university? These questions remain unresolved.

Usually, nursing schools are not the only campus units utilizing ITV, so scheduling the ITV-capable classrooms may become an issue. At both schools, the following questions arise. Who gets the prime teaching times? If Engineering has had prime hours for six years, should they always have them? If Nursing takes a "second best" schedule this semester, will it get a better one next semester? Working out a policy in this area helps resolve some of the friction that might arise from competition for scarce time resources. It may be necessary to form committees of concerned groups to develop and implement policies in a fair and equitable manner.

ITV provides one avenue for teaching RNs who wish to work toward a BSN degree in remote areas. This new technology offers an exciting way to deliver high-quality didactic nursing courses to people who want to maintain their professional positions, homes, families and community ties yet learn while living far from a main university campus. The problems which arise with use of this technology seem to be similar in Hawaii and New Mexico and are probably similar in any region of the country. The solutions to problems depend upon the resources, political acumen, and creative problem-solving ability of the system designers and users. The authors believe, in spite of the drawbacks of ITV, it offers a viable mechanism for improving access to nursing education, improving the health care of rural Americans, and advancing the nursing profession.

A Fourth Generation Distance Education System: Integrating Computer-Assisted Learning And Computer Conferencing

Allan C. Lauzon and George A. B. Moore

Distance education is emerging as a real force in education. It has begun to move from a marginal role to front and center. Much of this focus stems from a growing demand for educational opportunities designed for and directed toward specific target groups (Garrison 1986). Recent advances in educational technology are facilitating a shift from an industrial mass production model of distance education to personalized and individualized instruction with the potential of accommodating a variety of learning styles. This article reviews the literature pertaining to the Personalized System of Instruction (PSI), computer-assisted learning (CAL), computer conferencing (CC), and forms of instruction, then discusses how they can be integrated into a delivery system to enhance distance learning.

Personalized System of Instruction

Keller (1968), in his article entitled "Goodbye Teacher," presents his Personalized System of Instruction, introduced at the University of Brasilia in 1964 (McKeachie 1986). The system is based upon the principles that students perform better if they experience a sense of satisfaction and are actively engaged with the material to be learned (Herrmann 1982). There are five basic components to a PSI system:

1. Written material (printed text, audiovisual display, simulation, or programmed instruction);
2. Mastery of the material at a predetermined level of competency;
3. Rate of progress determined through student self-pacing;
4. Frequent testing for mastery; and
5. Feedback to inform students on their progress, identify problem areas, and direct students to appropriate reference materials.

Courses that have used this system have found that students are more satisfied and achieve a higher level of performance than those in conventional courses (Leppman and Herrmann 1982). McKeachie (1986) credits PSI and other modular methods as having more impact on college teaching in the 1970s than any other innovation. He also sees their use diminishing in the 1980s despite demonstrated value.

Computer-Assisted Learning

Kolp (1982) and Stirtzinger (1987) argue that techniques are needed that encourage active student participation in the learning process to achieve educational objectives. This, they argue, facilitates memorization of ambiguous material, conceptual understanding and application of learning to simulated or actual problems. One technology that lends itself to this type of program delivery is CAL.

CAL may be defined as the delivery of educational materials using computers as the main medium of communication between the instructor and the student. Advantages to this type of system include individualized instruction and self-pacing, allowing instructors to effectively deal with a diversity of backgrounds; self assessment, diagnoses of problem areas and reference to appropriate materials; provision of drill and practice exercises to facilitate the memorization of factual material; frequent updating of factual materials; and facilitating students' perceptions that learning is an active and dynamic process (Jones 1984; Martini and Sadura 1987; Stirtzinger 1987).

Recent experience in distance education at the British Open University found that successful implementation of CAL required: (1) accessibility — both physical and psychological (user friendliness); (2) integration in the course — avoid broad application and use only specialized pockets of CAL where appropriate; and (3) adequate training and documentation for students (Jones 1984). They also found that student avoidance of the technique was due to: (1) previous bad experiences with computers; (2) feelings that CAL was not essential to the course; or (3) fear that secret assessment was being conducted by the computer.

The significant capital and time investments involved — which may require five to eight years of course life to amortize (Kaye 1987) — have made CAL undesirable. However, recent developments such as the VITAL system at the University of Guelph, have reduced production costs to one third of those normally associated with CAL and are acceptable alternatives (Moore 1986 and 1987). This finding has been substantiated at Thailand's Sukhothai Thammathirat Open University in a microcomputer project tested in its distance education program (Sophasan and Prescott 1988). This should make CAL much more attractive as an alternative to conventional instructional methods.

CAL can meet the diverse needs and characteristics of adult learners by providing the opportunity for the learner to control and pace the learning experience in a safe and secure atmosphere (Garrison 1987). The combination of PSI principles and a CAL environment offers a powerful tool for the delivery and mastery of a body of specific knowledge.

Computer Conferencing

The development of electronic mail and computer conferencing systems such as CoSy, Participate, and Electronic Information Exchange System (EIES) has effectively removed the barriers of time and place as constraints upon communication. The very institutions and structures of society will be altered by this mode of communication. Already the literature is speaking of "online communities" that will be instrumental in the realization of the learning society by transforming current distance education systems into online educational communities. This transformation is already in motion with the offering of online graduate courses at the Ontario Institute for Studies in Education and other locations.

Computer conferencing provides a meeting place that has no physical or temporal boundaries; it is "virtual space" (Bissel et al. 1987; Hunter 1987). It allows asynchronous interaction in a variety of communication patterns, and all communications are stored and may be accessed, downloaded, and printed for review (Bissel et al. 1987).

Computer conferencing offers a number of advantages over conventional educational practice, particularly as it applies to distance education. Perhaps the most obvious is it provides a medium for asynchronous communication among the students and instructor, facilitating more interaction among all class members — students, instructors, guest lecturers, and any other individuals involved in class activities (Bissel et al. 1987; Davie 1987; Harasim 1987; Kaye 1987). This increased potential for class member interaction provides a number of new opportunities for both conventional and distance education practice.

Class members can participate in multiparty brainstorming sessions, group projects and collaboration, continuation of classroom discussions, and peer learning (Hunter 1987; Harasim 1987; Mason 1987). Dickson et al. (1987) argue that CC is an effective means to study issues, examine various opinions, and compare one's own opinion with that of others. Mason (1987) states that it encourages greater independence and self-reliance in learners, demands expression and critiquing of learners' opinions by all class members, and facilitates the idea that education is more than the passing of information from teacher to student. Mason also reports that a study conducted at the University of the District of Columbia found that both students and instructors preferred the type of group learning fostered by CC over conventional instructional methods in terms of effectiveness, skill development and enjoyment. Davie (1987) reports that graduate students perceived that intensity and quality of on-line interaction were superior to the interaction of the traditional classroom and that student performance in the online class surpassed performance in the conventional classroom. The increased capacity for communication provides an opportunity for developing a sense of community (Davie 1987). Through frequent communication and interaction students develop a cooperative atmosphere characterized by democratic principles and mutual support (Harasim 1987).

A second advantage for students is the convenience of having the "classroom" open twenty-four hours a day. Students can work around their schedules and have more control over the learning interaction (Davie 1987; Harasim 1987). Computer conferencing's flexibility accommodates individualized instruction and tutoring (Richards 1987).

Researchers have also found that CC appears to motivate students to complete assignments. Participants in the study by Davie (1987) reported that if they were to use computer conferencing effectively it was essential for them to be up to date in their readings and other assignments. However, the reality of individualized instruction is questionable when all students must be at the same point in their studies to actively participate in discussion. Harasim (1987) reports that students are motivated by the medium itself; they find it a fascinating means of communication and hence spend much time at the keyboard, communicating with their peers. The novelty of the medium may, given time, decrease as a motivational factor.

There are also a number of advantages from the instructor's perspective. Hunter (1987) suggests that electronic mail provides an alternative to conventional office hours. A student can "see" the instructor any time; if the instructor is diligent in answering mail, the student may receive a response the next day. Students even submit assignments via electronic mail in a specially supported course in computer science at the University of Waterloo. The need for students to have access and training in the use of software for uploading documents, however, may be a barrier to student achievement of course objectives; until friendlier electronic methods are available, collection of assignments should be conducted in conventional ways. CC offers the instructor an opportunity to build a dynamic database of course-related materials (Hunter 1987) and to use software to organize and structure input and output communication patterns (Kaye 1987).

Although there are a number of advantages to computer conferencing in education there are also a number of disadvantages. Students frequently resist using CC because of anxiety and lack of confidence in their ability to master computers, or because they realize it requires more work (Mason 1987). Harasim (1987) reports a number of disadvantages to online learning. Class members are often overwhelmed by the amount of material they are required to read — not only required texts but also messages in the conferences. Delays in receiving feedback may prove frustrating to some class members. Class members report difficulty following a variety of on-going discussions and deciding when to respond. The absence of visual cues is a problem early in the course but it decreased as students progressed in mastering the medium. Finally, some people expressed health and fatigue concerns related to prolonged computer use; bifocal or trifocal wearers report inconvenience reading computer screens.

A number of factors have been identified as instrumental in implementing a successful CC program for educational activity. The first is to ensure that all participants receive adequate hands-on training, documentation (manual or handouts), and support structures to help solve technical problems (Van Duren 1986; McCreary and Ord 1987). In addition, class members must experience full membership in the group, perceive and accept the purpose of the conference, and feel a need to use the medium to communicate with the group members (Van Duren 1986; Kaye 1987). Mason (1987) argues that successful conferencing is dependent on faculty providing structured tasks and guidance, and exhibiting a willingness to coerce students to use the system.

A Fourth Generation of Distance Education Systems

Garrison (1986) has identified three generations of technological delivery systems in distance education. Each generation of delivery system is analyzed in terms of the following dimensions:

1. Mode/communication channel — the sense (visual or auditory) and medium used for instruction and communication;
2. Delivery system — the means of communication;
3. Method of instruction — either individual or group; and
4. Mode of delivery — synchronous or asynchornous communication.

Garrison views these systems as building on their predecessors. CAL does not replace second generation systems; rather, it enhances the audio technology through the provision of visual channels of information.

Generation	First	Second	Third	Fourth
Medium	Correspondence	Teleconferencing	Computer-Based	Computer-Based
Message/ Communication Channel	Print/Visual	Audio/Auditory	Video, Audiovisual, and Auditory	Video, Audiovisual, and Auditory
Delivery System	Mail	Communications Network	Computer Terminal	Computer Terminal and Communications Network
Method of Instruction	Individual	Group	Individual	Individual and Group
Mode of Delivery	Asynchronous	Synchronous	Asynchronous	Asynchronous

Figure 1. Technology and Media in Distance Education. Adapted from Garrison (1986, 27)

Recent developments in computer conferencing systems are bringing a new dimension to distance education by making asynchronous communication possible. No longer must students be tied to a specific time for communicating but may communicate at any time in the twenty-four hour classroom. In addition, the integration of PSI, CAL, and CC provides the potential to deliver both asynchronous individualized instruction and group instruction to distance learners. This, in the author's opinion, constitutes a fourth generation delivery system for distance education; that is, the system is capable of both asynchronous group and individualized instruction and integrates the communications network with computer-based instruction.

Forms of Instruction

Successful application of a fourth generation delivery system is dependent upon understanding how the technologies can be used to enhance distance learning. This requires a brief review of instructional forms.

Kowitz and Smith (1987) list three forms of instruction:

1. Learning the basics;
2. Using basic skills to acquire technical abilities; and
3. Seeking to master the leading edge of knowledge and advance it.

Forms of Instruction	Assumptions	Control	Functions of Learning Activities
First	Learner has little if any knowledge	Instructor	Acquiring symbols, methods, and relationships used in the field of study.
Second	Learner skilled in the basics	Instructor/ Learner	Acquisition of useful technical abilities
Third	Learner skilled in the field	Learner	Seeks leading edge of current knowledge and seeks to go beyond it.

Figure 2. Three forms of Instruction.

Although the three forms of instruction appear categorically different, they represent positions on two dimensions: the density of content to be learned and the styles of human interaction. Content density varies over the three forms of instruction. First form instruction is characterized by learning the basics, which provides learners with the foundation to move toward increasingly significant and technical content. Kowitz and Smith (1987) write that learners move toward increasing content density.

The human interaction dimension assumes that different forms of instruction require different syles of learner/instructor interaction. First, form instruction is characterized by instructor control of the development, design, and evaluation, while in the third form the learner controls.

The first form of instruction is related to the mastery of specific content. The student is required to learn symbols, methods, and relationships peculiar to a specific field of study. The instructor's function is to motivate students through control of extrinsic rewards, to react and interact with the curriculum material, and to evaluate student performance.

In the second form of instruction students begin to assume an active role in their education. They now have a sound knowledge of the field of study and may actively engage in determining the direction of their education. The instructor needs to be an expert in the field of study as the student may now challenge the authority of the instructor. The teacher is still responsible for evaluation but the process may become more consultative with students having some input into design evaluation processes.

The third form of instruction is characterized by experts seeking to improve professional performance, master the leading edge of knowledge in their field, and advance knowledge through the "collective intelligence." This form is egalitarian; all members are teachers and learners.

Implications for a Fourth Generation Distance Education System

The integration of PSI, CAL, and CC into a fourth generation distance education system presents an opportunity for distance learning to become a viable option for learners ranging from those who have no knowledge of a discipline to those who are on the cutting edge of their field. The selection of the instructional form and technology mix will depend on the learner's knowledge of the discipline.

The application of a fourth generation system to first form instruction will require a heavy dependence on PSI and CAL. The learners at this stage need to acquire a knowledge base from which to work. The use of PSI principles in a CAL environment is the most effective and efficient means of accomplishing this objective. In this form of instruction the structure and organization of the learning is controlled by the instructor. There is little room for personalized instruction; students can control the pace and sequence of learning, but not the learning agenda. The use of computer conferencing in this form of instruction is less critical than in second and third forms of instruction. Since the primary objective is mastery of a specific body of knowledge, there will be little need for communication among students, although CC is a valuable tool for private tutoring and keeping in touch with the instructor. It might be used for group study, but this is unlikely if, as mentioned earlier, students must perceive a need to communicate or must be coerced to use the system.

The movement from the first to the second form of instruction will require an increased reliance on CC. This stage of instruction is characterized by the instructor relinquishing control to the students, who begin to question authority, set their own learning agenda, and explore content at a much deeper level. This is an opportunity to lay the foundations for peer learning; through interaction with one another, students challenge and modify their opinions and beliefs. The need to communicate with one another is satisfied by the computer conferencing system. There will be less reliance on CAL materials for this type of instruction since the task is more integration and application than it is mastery. PSI and CAL may be effective in introducing new material that builds upon the student's current knowledge of the discipline.

The third form of instruction will see a heavy reliance on CC and no need for PSI or CAL. It is for those on the leading edge of their disciplines, the creators of knowledge. Computer conferencing provides a virtual space in which individuals can meet and discuss areas of mutual interest in hopes of staying on top of their field and perhaps advancing knowledge through the collective intelligence of the online community.

Evidence from the Literature

Recent research findings suggest that linking forms of instruction to an appropriate mix of technologies is an adequate framework for conceptualizing the application of computers and communications technology to distance education. The role of CAL has been found to be most effective when used for mastering specific bodies of knowledge. Leppmann and Hermann (1982) found that students receiving PSI instruction in a CAL environment performed better and were more satisfied with their learning experience than were their cohorts in the conventional classroom. This technology would seem to be most effective for form one instruction, particularly for distance students.

McCreary and Van Duren (1987) found differences in the rate and nature of student participation in computer conferences according to academic level. In introductory undergraduate programs, participation distributions were skewed toward read-only participation, while in graduate student conferences most participants made regular comments and only a small percentage were read-only or intensely involved. The flow of information in undergraduate conferences was mostly from instructor to student, but graduate student conferences were characterized by multiple patterns of communication, signifying a more egalitarian atmosphere. One possible interpretation of this data is that the differences in participation rate occurred as a consequence of different instructional forms. In the introductory undergraduate courses it can be assumed that the objective would be to master a body of knowledge, and much of the learning would consist of a one-way flow of information to the student; perhaps the computer-conference is perceived by the student as just one more vehicle for the dissemination of information. The nature of graduate student education at the master's level would likely characterize the second form of instruction and a great deal of student interaction could be expected as the implications of the curriculum material were explored.

Black (1986) reports that CC is an ideal communication tool for bridging time and space among scientists who share similar interests. It provides them with an opportunity for professional development through participation in an ongoing documented discussion. Hiltz (1987) reports that a number of executives, many of them with advanced degrees, are successfully using online education as a source of professional education through the Western Behavioral Institute. Beckwith (1987, 89) describes the opportunities of online education as a medium that can be used by professionals to bring "together diverse and dispersed elements of a collective intelligence to create organized processes and solutions to substantial social problems." These examples illustrate the nature of third form instruction operating in a virtual space.

Conclusion

Distance education is no longer a marginal educational activity but is coming to be seen as a vital means for individuals to adapt to a changing world. Recent developments in educational technology are facilitating the development of a fourth generation distance education system knocking down the barriers of time and place. Geographically dispersed adults now have the opportunity to participate in a system that is interactive and personalized. However, if the benefits of technology are to be optimised, then educators must understand how they can be integrated to enhance the experience of the distance learner through careful consideration of educational objectives, appropriate forms of instruction, and an optimal mix of technologies to facilitate achievement of educational objectives.

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A Selection Model and Pre-Adoption Evaluation Instrument for Video Programs

Carla Lane

A major movement in distance education is the use of video programming augmented by textbooks, study guides, audio tapes, and computer software. The use of video programming has increased and hundreds of programs are offered for training, and graduate or undergraduate credit (Brey 1988). In most content areas, many programs or several telecourses are available so that adopters should evaluate programs before selection (Zigerell 1986).

The Corporation for Public Broadcasting found two media decision points: (1) the decision to use video as a form of education, and (2) the decision to offer a particular series. The 1980 CPB study showed that decisions on specific programming are usually based on an examination of availability, quality, perceived needs, potential enrollments, and costs (CPB 1980). The 1986 CPB (ELRA 1986) study showed that the prime selection criterion was the course's ability to attract new students. The second and third criteria were respectively, course content quality (a method to evaluate quality was not reported), and the ability to provide new resources or approaches.

Kressel (1986, 4-6) notes that concerns about quality and evaluation continue to plague selection personnel; material is being "cranked out" everywhere from obscure garage-top attics to high-tech production facilities. While the problems are apparent, the solutions are not according to Kressel. She urges a forum to disseminate effective media selection models and a debate over quality criteria and evaluation methods. She warns that without evaluation and quality control, distance education will fail.

Since the decision to adopt usually rests with administrators and faculty (Zigerell 1986; Brey 1988) who are unlikely to have media expertise, there is a need to train them in media selection and utilization (Heidt 1978; Meierhenry 1986; Knowles 1986; Kressel, 1986; Mayor and Dirr 1986; Hezel 1987).

Programming is being selected without benefit of appropriate evaluation procedures because an empirically based evaluation instrument does not exist (Teague 1986; Reiser and Gagné 1983; Kressel 1986) that details the educational criteria which should be met. The decision to adopt is not grounded in media selection methods and as a result programming may be adopted from which optimal learning by the student does not occur (Knowles 1986) because of unplanned and ineffective instruction (Gueulette 1988).

Educational literature is flooded with instruments which have been developed for use in evaluating learning resources and instructional materials (Teague 1986). There is agreement in the literature that media should be evaluated; however, there is little agreement on what constitutes good evaluation (Tanzman and Dunn 1971; Armstrong 1973; EPIE 1973; NEA 1976; Bergeson 1976; Komoski 1977; Sive 1978; Hewitt 1980, 1982; Kressel 1986; Mayor and Dirr 1986).

Kressel asks, "What is a credit-worthy telecourse vs. slick television?" and "What is sound education vs. entertainment?" (1986, 6). She concludes there is no evaluation procedure that ensures students will learn, and thus no current answer to the question, "Is it sound education worthy of credit?" There is a need for a decision-making strategy (Bates 1987).

Improved media selection procedures can change the situation (Sive 1978, 1983; Niemi 1971; Teague 1986). An adoption process that includes an evaluation instrument based on media selection methods would ensure that adopters evaluate media using the best available media selection methods to help ensure the selection of resources that will make genuine contributions to student learning. Teague suggests that an evaluation instrument should contain specific criteria and force the evaluator to apply the criteria to the resources. Teague performed an analysis of evaluation forms and concluded that several factors tend to limit their effective post-secondary use (1986). Most forms: (a) are for use with elementary and secondary materials, (b) evaluate one medium, (c) ask for general conclusions, (d) include no reference to evaluative criteria, (e) ask for excessive amounts of non-evaluative information, and (f) are too detailed and lengthy.

Reiser and Gagné (1983) reviewed nine media selection models. They conclude that information concerning the models' usefulness was limited due to the rarity of finding detailed information about situations in which models were employed, and limited empirical evidence about the models' relative merits. Bates (1980) suggests that efforts to demonstrate linkages between type of media and teaching objectives are fruitless. Media research does not provide a clear direction for evaluators as it does not address how components interact to produce learning outcomes where there are differences in learners, instructional treatments, and content. He states that the impact of television depends on a combination of media and factors related to the program's organization, video programs, and learners. Existing models are more useful to designers than to adopters who are not selecting media for production but are faced with a pre-produced package of media to be adopted or rejected.

Developing a Model and Evaluation Instrument

A modified two-round Delphi technique was used to develop the model and evaluation instrument because it is a systematic method to elicit expert opinion. The sample included 400 administrators, instructors, producers, directors, writers, instructional designers, distributors, consortia members, and authors. Scores were calculated for 112 respondents who took part in both rounds. Respondents ranked their knowledge and the importance of the statement on a scale of one (low) to four (high). The mean for each statement was reported and represented the relative amount of knowledge the group felt that it had about the statement or the relative amount of importance the group attached to the statement. Both are valid indicators of the mean accuracy of group responses (Dalkey et al. 1969). Those respondents ranking their knowledge at four, "quite sure" of their response, composed an expert subgroup for that statement (Dalkey et al. 1969). An 80 percent consensus of the expert subgroup was accepted as the final consensus (Helmer 1966; Dalkey et al. 1969; Kalton 1983).

Based upon the literature, nine significant concerns were derived as an interactive model of educational and media concerns and a questionnaire with 23 representative statements was created (Brown 1968). The nine areas were educational objectives, instructional design, content, textbook, faculty guide, study guide, computer software, video, and cost. The questions were open ended so that respondents could edit or add questions (Brown 1968; Dalkey 1969). A pre-test was conducted by a panel of six judges. The index of content validity was set at 50 percent agreement of the judges' ratings; this was met. Consensus was set at 50 percent of the respondents' ranking the importance at four (high); if below that, the expert subgroup score was taken to deem consensus at 50 percent. All of the original statements were retained.

The instrument contained 72 statements based upon respondents' feedback, which included scores, comments, and subsidiary statements. When a subsidiary question or rewording was suggested, it was researched and if supported in the literature, it appeared in the second round (Brown 1968). Respondents suggested adding 28 subsidiary statements; 9 statements were finance related; and 21 statements were separated into smaller groups of evaluating criteria and rewritten so that scores would accurately reflect the judgment of respondents. Consensus was set at 80 percent of the expert subgroup; if below that, the question was deleted. The 9 evaluation areas were supported; 57 statements were supported. The 15 statements which were not supported were in production, areas which were covered by credit-granting regulations, delivery methods, or other institutional procedures. A post-test was conducted on a panel of 6 judges. The index of content validity was set at 80 percent agreement of the judges' ratings; this was met.

Given iteration with feedback, the group should exhibit convergence of opinion toward consensus (Dalkey et al. 1969), which is reflected in the interquartile deviation (QD). This is a gross measure of how widely the answers differed (Brown and Helmer 1964) and is the standard deviation of the middle 50 percent of responses on one statement. This is a valid indicator of the mean accuracy of group responses (Dalkey et al. 1969). Based upon the expert subgroup scores showing agreement at or above 80 percent and experts' QDs at .000, it is assumed that group judgment was operating rather than personal attitudes (Dalkey and Brown 1971).

Results

There were 178 respondents to the first round, which was a 44 percent return rate. They were sent the second round survey and 112 responded, which was a 62 percent return rate and 28 percent of the original sample. Respondents represented all 50 states, Canada, and Great Britain. The mean number of years in training or education was 9.9. Fifty percent of the respondents held masters degrees and 35.7 percent held doctorates. A degree in education was held by 64.3 percent of the respondents. Seventy percent of the respondents were directly responsible for distance education, 16.1 percent were administrators, 6.3 percent were instructors, and 9.8 percent were media producers.

No standardized, empirically based, or acceptable selection models or instruments were provided by the respondents; 68.9 percent do not conduct any evaluation; 27.7 percent conduct student evaluations; and only 2.9 percent use or are developing a pre-adoption instrument. Respondents' comments and lack of evaluation-supported statements demonstrate that evaluation procedures do not exist, and adoption has not been grounded in empirically based methodology.

Final Questions Generated by the Delphi Process

Section 1: Educational Objectives and Expert Consensus Percentage

1. Are objectives for the telecourse and each component stated in cognitive, affective, and psychomotor statements appropriate for the content? (86 percent)
2. Are objectives for the telecourse and each component at a level of difficulty appropriate for the content and learners? (90.8)
3. Are objectives achievable by the institution's average student; and can levels of achievement be measured under specified conditions? (94.8)
4. Will the telecourse meet the educational objectives of learners as either a required or as an elective course? (94)
5. Are the telecourse objectives and content equivalent/similar to the on-campus course? (87.5)
6. If the telecourse is not equivalent to the on-campus course, can it be adapted to be equivalent? (86.1)

Section 2: Instructional Design

7. Is the telecourse fully planned and logically organized? (97.4)
8. Is each telecourse component necessary, well coordinated, and does it accomplish objectives for which it was designed? (96.8)
9. Does the telecourse use teaching strategies appropriate for traditional and adult learners? (84.9)
10. Does the telecourse use a variety of teaching strategies appropriate to the content, which reach learners who prefer to learn through visual, auditory, tactile (hands-on), and kinesthetic (emotional experiences) methods? (80.9)
11. Is the lesson size (amount and difficulty of content), number, pace, depth, and sequence appropriate for the content and learners? (93.8)
12. Do components encourage learner interaction with the content by posing challenging questions and providing answers when appropriate, through written assignments and other techniques which motivate learner participation? (80.4)
13. Do components encourage critical viewing, reading, and thinking? (91.8)
14. Are appropriate visuals used in each visual component, which contribute to student learning? (95.9)
15. Is language appropriate for content and learners; interesting, understandable, and similar throughout all components? (97.3)
16. Is the language in the video component effectively delivered; is it well-phrased, and easy to listen to? (95.1)

17. Is the language in print components readable? (97.6)
18. Is self-directed learning encouraged in all components? (83.0)
19. Are assignments appropriate for learners and content? (92.8)
20. Are assignments of interest to learners and balanced between viewing, reading, experiential, and interactive activities appropriate for distance learning? (92.8)

Section 3: Content

21. Is the content appropriate to course title, description, and credit hours? (94.2)
22. Is the content accurate, clear, comprehensive, balanced, current, and well-documented? (96.8)

Section 4: Textbook

23. Is the textbook designed and written for the telecourse or do they correlate well? Do textbook revisions match video revisions? (86.4)
24. Does the textbook facilitate student comprehension through language and pace appropriate for the course and learners? (90.5)
25. Is the cost of the textbook reasonable for students? (81.4)
26. Will the textbook be available from the publisher at the scheduled time? (96.0)

Section 5: Faculty Guide

27. Does the faculty guide contain segments for new faculty; faculty responsibilities; objectives for the telecourse and each component; instructional design; lesson outlines; a variety of assignments that encourage involvement; and optional syllabi for different texts, settings, and semester lengths? (87.5)
28. Does the faculty guide contain teaching strategies appropriate for content for traditional and adult learners; student level; student needs, student(s), grading, and other forms of instructor feedback to the distance learner? (81.2)
29. Does the faculty guide test bank have clearly stated objectives and essay questions relevant to objectives and content; are questions included on video, text, and other components; are test keys included; are content locations of test answers listed; and do tests have validity? (93.0)
30. Are test formats appropriate for at-home tests, proctored testing, and computer testing? (84.9)
31. Has the faculty guide been updated if the textbook or video have been revised? (94.0)

32. Does the copyright and format of the faculty guide allow changes by the user institution? (87.9)

Section 6: Student Study Guide

33. Does the study guide contain segments on objectives, components, lesson outlines, video outlines, glossary, key concepts, references, exercises, self-tests with explanations, self-directed learning strategies, and activities to pursue personal interests appropriate for the content? (94.4)
34. Does the student study guide contribute to the student achieving objectives by serving as the student's personal tutor and directing the student's learning from the components? (91.0)
35. Is the cost of the study guide appropriate for the institution's students? (88.4)
36. Does the copyright and format of the study guide allow changes by the user institution? (81.0)

Section 7: Computer Software

37. Is the computer software appropriate to content; does it contribute to achieving educational objectives? (91.3)
38. Are computer software versions and documentation available for most campus and student computer systems (IBM, Apple, Macintosh)? (86.4)
39. Is the computer software appropriate to the students' computer literacy; user friendly and error free? (95.8)
40. Is the computer software available for site or home licensing? (90.5)
41. Is the computer software cost appropriate for the institution and the institution's students? (88.5)

Section 8: Video

42. Does the video technical quality meet professional broadcast quality standards if it is to be broadcast? (82.9)
43. Does the video technical quality meet quality standards appropriate to the delivery method for which it is intended to be used such as cable, ITFS, fiber optic cable, learning center, or tapes loaned to students? (90.9)
44. Does program length fit standard periods such as thirty or sixty minutes (as opposed to forty-one, nineteen minutes or forty-seven minutes, which do not fit thirty minute programming periods)? (80.5)
45. Is the treatment appropriate to content: documentary, lecture, discussion, panel, drama, humor, etc., and does not exclusively use a lecture or "talking head" format? (80.5)

46. Is the dialogue believable in the video program? (80.0)
47. Does the television program give the same message in spoken words and video? (84.1)
48. Does the video enrich learning with real-life application of theoretical content by conducting video experiments and demonstrations in realistic settings (industrial laboratory, office, etc.) or video field trips to realistic locations (museums, factories, clinics, etc.)? (88.4)
49. Does the video advance content understanding by providing appropriate pace? (84.1)
50. Are production values high so that the production becomes invisible; production values include appropriate camera shots, good lighting, color balance, motion sequences, special/digital effects appropriately used, consistently good level of audio, and clean editing? (80.9)
51. Are voice and sound imaginatively used to advance content? (82.3)
52. Is the instructor(s) a skillful presenter who has content expertise and who communicates a sincere enthusiasm for the subject? (90.7)
53. Are actors competent in their craft? (82.0)

Section 9: Cost

54. Is the cost appropriate for the institution's available funding?
55. Can target learners and enrollment potential be identified?
56. Is the licensing contract appropriate for the institution's delivery methods and length of use?
57. Are dubbing masters easily accessible and in excellent condition?

Discussion of Some Major Findings

Statements incorporating adult education principles, methods, or teaching strategies reached consensus except for the use of learning contracts (rejected at 72.1 percent). Based upon the number of respondents ranking themselves with high knowledge (35), as well as the low group knowledge (35.7 percent), and importance scores (33.9 percent), there is little knowledge about learning contracts or how they can be used with telecourses.

One statement questioned whether strategies should be evaluated for their ability to reach all student-learning styles and was accepted (80 percent). The comments and the lower group score (48 percent) suggest that learning styles and how they may be applied to media are not well understood. Respondents perceived that visual and auditory styles can be addressed, but do not perceive that tactile, kinesthetic, or interactive styles can be addressed through all components.

All statements regarding shelf life were rejected (69.8 to 74.6 percent). Producers indicated that a two to three year shelf life was normal; users wanted a much longer shelf life for cost effectiveness, which indicates that producers should minimize aspects which directly affect shelf life. A possible solution is to package content with the shortest life in one video program or in print supplements, which could be updated at minimal expense to producers or users.

There were two statements on video technical quality that received consensus. One stated that the video technical quality should meet professional broadcast quality standards (82.9 percent). The second stated that video technical quality should meet professional broadcast quality standards appropriate to the delivery method (cable, ITFS, broadcast, learning center, etc.) (90.9 percent). There has been a long-standing discussion about video technical quality and learning differences, if any, between educational programming produced with low or high production values. Opinion polarized into two areas. One group believed that production values were acceptable if they fit the delivery method. The second group believed that production values must meet broadcast standards because students are constantly exposed to it and will judge educational programming by their experience with commercial television. The implication for producers is that they will need to produce programming that meets broadcast quality standards in order to meet both needs. If production is less than broadcast quality, they will lose part of the market.

A statement that a total of fifteen hours of video programming is ideal was rejected (47.1 percent). Comments documented that a new regulatory factor has emerged where some accrediting agencies have set student contact hours at forty-five hours, the same amount required for traditional classes. This has made the fifteen-hour telecourse unacceptable to institutions operating under these regulations as additional projects cannot be substituted for contact hours. The fifteen-hour telecourse carries one credit hour; respondents felt that students would not register for this. This has implications for program design and funding and is a warning that the forty-five hour contact regulation may be broadly applied. Respondents' concerns are that it increases tape costs, replacement courses are difficult to find, and broadcast time becomes limited. Solutions may be lecture audio tapes or classes conducted via audio bridge. If the fifteen-hour telecourse is to be defended, the defense will have to be based on its quality, excellence, and research showing that equivalent educational objectives can be achieved in fifteen hours by a multi-media program as that obtained from forty-five contact hours.

A statement regarding importance of experts being nationally recognized was rejected (44.3 percent). This has implications for producers who use experts.

Statements were rejected about profit projection (45.0 percent) and comparison of cost effectiveness of similar courses (70.4 percent). Comments indicated that it is difficult to project income. Shrinking resources would seem to mandate that distance educators develop this management ability.

A statement about the inclusion of marketing concepts and materials was rejected (64.6 percent).

Conclusions

The media selection model and its evaluating instrument require evaluators to apply specific criteria to the telecourse to determine the suitability of its use in the program. The model and the evaluating instrument consider the combination of media and factors related to the course's general organization, video programs, and learners. It can be used with training or post-secondary materials to evaluate more than one medium and is short enough to be of practical use.

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Business, Education, and Distance Education

Stephen Murgatroyd

The study of business organizations is typically divided into many separate fields of study. For example, the business studies curriculum usually involves the study of organizational behavior and theory, accounting, finance, marketing, business law, production and operations management, business communications, management information systems and business policy. In some business schools, these subject specialties are further subdivided, and students are encouraged to develop both a broad knowledge of each discipline area and a detailed knowledge of a special area of study.

More recently, however (and especially in European programs) there is an attempt to reintegrate the curriculum of business and organizational studies around three broad areas of study: strategic management, human resource management and the management of information systems and technological innovation. Indeed, it can be argued that the "new" curriculum is increasingly integrated around strategic management questions. One clear demonstration of this construction of business education is the curriculum structure of the MBA program at the Open University of the United Kingdom, often referred to in this paper as OU(UK).

In this article these three major frameworks for the study of organizations are examined as a basis for exploring the question: What can be learned from the study of these frameworks that can be of value to those who manage and work in distance education programs? This article develops from an earlier contribution (Murgatroyd and Woudstra 1989) and from several contributions to the literature of educational administration (Murgatroyd 1984, 1986, 1988, 1989; Murgatroyd and Reynolds 1987).

Key Assumptions

A key assumption of this article is that distance education programs and institutions are in an extremely competitive environment and depend crucially on the reactions of their customers for both their continued operation and future growth. Unlike conventional post-secondary institutions, the market for courses, programs and products critically affects not only what is offered but also how offerings are both managed and delivered. Indeed, those distance education programs offered within conventional institutions are often judged on market and performance criteria in ways that differ from the evaluation of conventional programs.

Given the critical importance of customers[1] in shaping both what is needed and how products are delivered, it is essential that those developing distance education programs understand the dynamics of the six competitive forces: (1) the power of buyers of services (students, governments, companies and organizations); (2) the power of suppliers to influence products (especially publishers, broadcasters, co-operating institutions and the vendors of technology); (3) the impact of new entrants in the market (especially the corporate sector, private educational institutions and conventional providers seeking to diversify their product line); (4) the power of new technology to have an impact on the nature of the program and service offered; (5) the nature of existing competition within the market for service; and (6) the power of governments to regulate and control the provision of services. By looking at these forces in relation to the question "What business are we in?," distance educators can begin to understand more directly the nature of the marketplace and the conditions under which they are working.

This analysis leads to a second set of assumptions that concern competitive strategy. Porter (1985) identifies four primary market strategies among which any organization seeking to occupy and sustain its position in the marketplace needs to choose. These are: (1) the least-cost provider in the largest possible market e.g., the child rearing and development courses developed by the OU(UK) as part of its community education program; (2) the least-cost provider in a niche market e.g., the nursing process package developed by the OU(UK) as part of its health and social welfare program; (3) the excellent provider in a broad market, where quality rather than cost is the basis for customer choice e.g., Athabasca University's undergraduate student program in management; and (4) the excellent provider in a niche market e.g., the MBA programs offered by Deakin (Australia), Strathclyde (Scotland), and the OU(UK). Porter suggests (1980) that an organization that adopts more than one strategy is likely not to be able to sustain its market position unless each separate strategy is managed distinctively and autonomously. Indeed, Porter's analysis is directed at showing just why organizations pursuing multiple strategies are likely to fail.

The reason this kind of strategic analysis is important links to two factors: (1) sustainable market positions and (2) the value chains that operate in the day-to-day management of the strategy.

Government-funded conventional educational institutions have had conferred upon them by their history and organization a sustainable market position.[2] Private colleges and educational institutions and distance education programs and institutions have to create their market position. In doing so they are seeking not to simply gain market share, but to ensure their markets continue to be available over a period of time. While changing markets have to be accounted for, changes have to be seen as strategic choices made by an organization. For example, the Open University's decision to enter the noncredit/continuing education field was a strategic choice taken very deliberately by the University. In contrast, Athabasca University's noncredit activities are not strategically directed at this time. The choice of sustainable strategy has major human and financial implications as well as implications for the structure of the organization.

The structural, personnel and financial implications of the choice of strategy made by an organization are reflected in the value (both strategic and financial) associated with each activity within the organization. This matter is explored in more depth by Woudstra and Powell (1989). The key point to note is that the functional activities of organizations are direct expressions of the values of the organization, which are in turn direct expressions of the strategy of the organization. Thus, the maintenance of thirteen regional centers by the OU(UK) is an expression of the strategic value of regionalism for the sustainable strategy now being pursued nationally by the University. The absence of such an elaborate regional structure within Athabasca University's operation is a reflection both of a different view of both regionalism and nationalism. It is interesting that in both institutions, the strategic value of regional operations is constantly being questioned.

Strategic Management

Murgatroyd and Woudstra (1989) differentiate between strategic planning (focusing upon predictability) and strategic management (focusing upon competencies needed in order to cope with uncertainty). The contrast is derived largely from the literature of strategic management in the business sector (Andrews 1984; Johnson et al. 1989). What does this difference mean in practice? How does this difference help us understand issues in the management of distance education?

A focus on strategic management relates to the task of management in three direct ways. First, it requires management to invest in the development of the competencies of all staff—academic, professional and support, for from staff will come responsiveness to change and the ability to innovate. The staff nearest the customer will be the first to recognize the signs of change to which the organization will need to respond. Thus, front-line staff (tutors, receptionists, counselors) need to be encouraged to make suggestions for change and to take responsibility for continuous improvement in their own work. At Toyota's main factory the annual number of improvement suggestions generated by the 9,800 workers is estimated at 890,000—management implement on average some 90 percent of these suggestions. A "people" strategy derived from strategic management encourages people to take responsibility for their work and to be accountable; it also encourages management to invest resources in skill development.

Second, a focus on strategic management requires managers to organize their activities so they have flexibility rather than rigidity in terms of resources, organization and people. Management needs to constantly strive to secure the ability to reallocate financial resources, capital equipment and people to new projects and tasks as they emerge. Furthermore, they need to reduce overhead in as systematic a way as possible; for example, through the use of just-in-time inventory and purchasing systems in the case of print-based materials (Schonberger 1982; Hall 1983) so as to be able to reduce the underlying operating costs associated with their basic operations. Neither of these things is easy in academic organizations. For example, tenured academic and professional staff represent a significant cost to some distance teaching organizations (65 percent of all base budget resources are dedicated to salaries at Athabasca University and the figure is much higher elsewhere), and the information technology systems they use are also very expensive to operate and involve a significant overhead. Furthermore, some distance teaching organizations have organized themselves in structures which may inhibit flexible response to change and innovation. An example is the use of Faculties at both Athabasca University and the Open University, compared with more flexible staffing in The Open Learning Agencies in British Columbia and Hong Kong. What matters most is not the beauty of the organizational chart, but the responsive of the organization.

Third, strategic management requires organizations to focus upon what is known as "outside-in" thinking versus "inside-out" thinking. Xerox corporation saw itself as the provider of xerographic technology and saw itself as immune from competition. When it faced serious and sustained competition from Japanese companies it simply sought to protect itself through legal means, rather than developing a market-driven response by producing new equipment and competing in the marketplace. In the space of a few years, Xerox lost around 47 percent of the market to rivals (Jacobson and Hillkirk 1986). Xerox was thinking from the inside-out—it used its own logic and assumptions to describe to itself what the world "out there" was actually like and to establish its place in that world. It was wrong. In contrast, a company like British Airways has had to listen to its customers and look at the way the world of aviation is rapidly changing (especially in relation to deregulation). By bringing the outside world into the company through focus groups, customer surveys, competitor analysis workshops and closer links with the hotel and travel industry, British Airways is increasing its market share while at the same time reducing its operating costs. British Airways uses its teams to look from the outside into the company.

In terms of distance education, looking from the inside-out encourages individuals and groups to make use of advanced technologies to better service the market. However, looking from the outside-in (at least in North America), the issues customers bring to distance education are not response speed or technological sophistication but credibility, portability, transferability and flexibility. In short, a focus upon the integration of distance learning into more established forms of education and learning is a key focus for customers, not technology. By looking at the outside-in messages, managers in distance education can avoid expensive market mistakes. Another example of this is to ask the question, Whose needs will this course serve? An inside-out approach places emphasis on academic credibility—will this course be acceptable to colleagues from other institutions? From the outside-in the question is relevance—will this course meet the needs of the market it is intended to serve? Educational institutions (especially universities) are traditionally inside-out institutions. Businesses, to stay competitive, are increasingly becoming outside-in. Distance education organizations need to consider this issue very carefully.

Strategic planning for continuity and for improvement of the organization is important, but so too is strategic management. By focusing upon the development of competencies and on the creation of flexibility within the organization and by becoming an outside-in organization, a distance learning unit or institution can retain innovation and market relevance as key features of their operation. Seeking to establish firm structures, tight financial management and medium- to long-term objectives that embrace all aspects of the organization may lead to entropy. One characteristic of permanently failing organizations is the complexity of their planning (Meyer and Zucker 1989).

Putting People First - Human Resource Management

At the center of our understanding of the modern business organization are people. People innovate, create, convert ideas into reality and solve problems. Some people are pathfinders—they provide the insight, vision and direction needed for a new development. Others are implementers—they take the strategic vision enunciated by others and make it operational. Yet others are problem solvers—they look at the operational plan and implementation strategy and work to continuously improve the way in which an operation is managed. This model of the varying roles of people in an organization is derived from Harold Leavitt's (1986) study of corporate leadership. He notes that a sound organization needs all three kinds of people and needs them at all levels of the organization.

In both the Open University and Athabasca University, pathfinders were essential to the creation of the organization. Lord Perry of Walton (the first Vice Chancellor) for the Open University and Tim Bryne and Sam Smith (the first two Presidents) at Athabasca ensured that these two organizations would survive complex and eventful histories. They were pathfinders, often having to beat down barriers and remove doubts before being able to share their vision and enable others to implement it.

There are, however, important differences between organizations in terms of who can make decisions and the process by which decisions are made. For example, U.S. companies are highly organized in functional divisions; i.e., production, sales, personnel, etc., which are integrated through the work of executive officers and an executive committee. In fact, some 92 percent of U.S. corporations are organized in this way (Kagono et al. 1985). In contrast, a large number of Japanese companies are not organized around this same functional division; less than 55 percent of Japanese firms are organized in this way (Kagono et al. 1985). Instead, they make more extensive use of lateral project-based or task-team structures. This leads to other significant differences between these two kinds of organizations in terms of leadership.

First, U.S. executives are more task-oriented than their Japanese counterparts, who are more information-oriented. Second, U.S. executives place far more emphasis on confrontation as a problem-solving device than their Japanese counterparts, who prefer *nemawashi* (broad consultation before making decisions) in such situations. Finally, the most powerful groups within an organization in the U.S. are the finance and the control departments (quality control and cost control). In Japan, the most powerful units are those directly concerned with the production of goods and services. This is a sharp contrast. In the U.S. those who have least to

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do with the product or service have the most control; in Japan those who have most to do with the customer and the product have most control.

These contrasts have had an important bearing on current developments in many U.S. corporations. In the face of the growing success of Japanese companies in gaining a market share (though not necessarily in terms of return on equity or profitability at this point), several U.S. corporations are making significant changes to their management practices and organizational designs so they can become more responsive to the rapidly changing marketplace for goods and services and to the globalization of these markets. These developments are especially noticeable in the service sector of the economy, which accounts for a growing proportion of GNP in all Western countries. In the U.S., private and government services employ around 73 percent of the work force, as noted by Shelp (1984).

Central to these developments has been the increasing involvement of workers in contributing to service improvement. Several major case studies, including those of Federal Express (Merliss and Lovelock 1980, 1981), the Lex Service Group (Baden and Carter 1972) and the Rusty Pelican Restaurant Group (Wyckoff 1984) emphasize the increased involvement of workers in decision making, constant improvement and decisions about profitability in service businesses. Furthermore, as Deming (1986) notes, involvement should aim to promote training on the job, to remove barriers between staff in different units, to encourage self-improvement for everyone, to remove exhortations, to end annual objectives and assessment (these should be constant processes, not occasional) and finally, to facilitate leadership at all levels of the organization. Some specific strategies for achieving these broad human resource objectives have been outlined by Deming (1980), Juran (1988) and others.

What are the implications of these developments for the managers of distance education programs and organizations? There are three key points. First, old models of hierarchy are unlikely to produce constant improvement in the pedagogy of distance learning materials and in the quality of student learning experiences. Organizations that are seeking to create leadership in distance education need to be task-structured and integrated, rather than functionally divided. Second, improvement is something that is to be sought as a constant feature of the organization, not something that happens occasionally. Just as most manufacturing processes involve constant process changes, so too does the process of course production and the provision of learning experiences. Distance education providers need to learn that those nearest to the customer have most to offer in terms of constant improvement. Tutors, receptionists, administrators, secretaries, instructional designers and evaluators often know more about the learning experiences of students and how they can be improved than academic and subject matter experts. Finally, the real message is that "if it ain't broke, improve it" (McConkey 1986). In the competitive world of educational services, an organization that "has the answer today" will be out of answers tomorrow. This in itself suggests the modularization of courses and programs and the need to invest in processes that permit constant improvement (for example, desktop publishing, just-in-time purchasing and inventory control). So as to maintain sustainable competitive advantage, organizations need to invest in the personal development of their staff, whatever role they play in the organization.

Managing Innovation and Controlling Technology

Investment in new technologies in U.S. corporations has risen over the last five years by 12 percent. In this same period, the productivity of these same companies has risen by only 2 percent. Indeed, in precisely the period of the first computer age (1977-1987), real GDP (Gross Domestic Product) in the U.S. grew on average less than 1 percent per annum, and was actually a negative number in three of these eleven years. In this same period, after-tax profits for U.S. corporations have been relatively stable, showing a slight decline in the period since 1984. The promise that technology would reduce the working week and the size of the work force has also been denied by experience. The work force actually increased more than 2 percent per annum (year over year percentage change) during these eleven years. Instead of simplifying our life, creating new leisure time and increasing organizational effectiveness, some technological developments have opened new possibilities for organizational chaos, while others have made our lives more complex.

A significant issue facing most medium to large companies relates to the control of technology investment and the development of structured approaches to information technology development. Athabasca University recently completed the first stage of a multi-stage information technology review that looked at the place of technology in each of the key value chains that form the basis of the business of the University.[3] This analysis shows that technology-related activities cost the University in excess of $1.5 million annually and that the unit cost of technology-related transactions is growing. The study also shows that the most significant investments are in two value chains: (1) admissions and credit transfer, and (2) course delivery. The lowest levels of investment (in terms of budget proportions) are in the course development/production, course registration/dispatch and marketing and service value chains.

Such an analysis becomes more refined when we consider transaction costs in relation to each of these value chains. For example, the admission of a student to an academic program of study costs (approximately) $68 per student, while a nonprogram admission costs $17. The technology-related costs of each course delivered to a student at Athabasca University is (approximately) $31. The total information technology costs of a degree delivered at Athabasca University to a student with no transfer credits is (approximately) $1,506. Given the strategic importance of program registrations and program completions to Athabasca University, such a level of detailed analysis permits us to examine the relationship between activities of strategic value and cost.

Such a concern with technology and costs may seem surprising for an academic institution dedicated to distance education. Yet experience elsewhere suggests that failure to examine the link between investment and returns in relation to technology can be very damaging both to the operations of the organization and the effectiveness of its services. Indeed, in other public institutions this concern to manage the use of technology in terms of both strategic values and cost is also evident; see, for example, Kimberly and Evanisko (1981) and their study of technological innovations in hospitals.

The underlying management issue is how can innovation and development be controlled in such a way that the organization remains creative and innovative so that it can add to its competitive position without the organization losing control over cost and human resources? The point is that technological innovation is not valuable for its own sake; it is only valuable if it adds value to an existing service. Indeed, some technological developments can actually be disadvantageous to an organization, as witnessed by those who made significant investments in the early "teaching machines," PLATO or other similar technologies.

Porter (1985) examines the relationship between technological investment and the four generic competitive strategies briefly outlined earlier in this article. Those seeking to occupy the position of least-cost provider in a broad market try to use technologies to reduce production and development costs, to simplify operations and to produce economy. Those seeking to offer cost leadership in a niche market attempt to use technology to better meet the needs of the niche and to gear production to just the right quantities for the niche. Others seeking to be leaders in a broad market area on the basis of quality use technology to enhance product quality, increase reliability of services and follow-up and create faster response times for orders. Finally, those seeking the position of excellent provider in a niche market adopt technology as a means of customizing products to the various segments within the niche, in order to raise buyer value and to differentiate its products and services from those with a broader based market strategy. These observations make it clear that the evaluation of the utility of a technological investment—in, say, electronic publishing systems, packet radio for course distribution or computer-aided learning—is a function not of the specific utility of the service but of the relationship between this investment and the generic strategy being pursued by the organization. A failure to recognize this will lead to many expensive false starts, something with which the history of distance education (especially in North America) is full.

Investment decisions in relation to technology are simply a special case of a broader issue facing modern managers: how can innovation be encouraged within the framework of strategy? This is an issue addressed by Shrivastava and Souder (1987), as well as several others (see especially Gram and Crawford 1986). These authors make the point that the critical questions faced by an organization relate to competitive strategy and to integration of activity within the firm. Technological innovation sponsored and supported by one unit, which is not connected to the work of other units, is likely to be an under-used investment and could create problems for the development of both the strategy and the culture of the organization. What seems most effective is an emphasis on cross-unit task teams rather than functional unit divisions for the management of innovation. This links to the earlier points about organizational design and the development of people skills.

Many distance education institutions use task teams for a variety of functions. Two classic examples are course teams at both the OU(UK) and Athabasca University and the quality of student services committee at Athabasca, a cross-unit planning/management group. To be effective within the organization as a whole, such teams need flexible mandates and resources, clear reporting lines and someone who will champion the teams' work throughout the organization. Many significant innovations have failed simply because no one acted as a champion for the team (Foster 1986), and many have succeeded simply because of the presence of a champion (Nayak and Ketteringham 1986). Such teams are the most likely sources of either direct innovation or the adaptation of innovations from other organizations. At the top of all distance education programs and institutions there needs to be a strong executive team that sets clear paths, goals and standards and then supports others at all levels of the organization in the process of innovation and implementation.

Conclusion

This article has used three basic frameworks for the exploration of current developments in the world of business: strategic management, human resource development and the management of innovation and technology. All these frameworks have been underscored by some key assumptions about competitive strategy and strategic positioning.

Many other issues could have been examined, including the issue of globalization of the business environment (Porter 1986) and the rapid application of manufacturing principles to the service sector (Leavitt 1976; Sherman 1984)—both of which have implications for the management of distance education. However, in such an introductory article the key point has been that decision making needs to be linked to strategic thinking, people investments and values. Furthermore, there are some organizational designs that are likely to be effective in sustaining competitive advantage and some less likely to be effective; indeed, there are such things as permanently failing organizations (Meyer and Zucker 1989).

Those who have a management responsibility for distance education programs, investments or institutions can learn much of value from the study of strategic management and competitive strategy. They would do well to study some of the findings of relatively recent evaluations of Japanese production and development methods (Schonberger 1982; Suzaki 1987), since there are several major connections between these developments and the management of educational institutions (Murgatroyd 1989). Finally, rather than argue that educational organizations are so different from business organizations, managers should look to the similarities. By doing so, they will be surprised at how much the two kinds of organizations have in common.

Notes

1. The term "customers" is used in a broad sense to encompass students, institutions and those who pay for services; for example, government, cooperating educational institutions and organizations that contract for services.
2. There are exceptions. For example, the UK Government decided not to offer financial support to one university institution in Wales that had

poor fiscal management, thus causing the institution to merge with another and thereby lose its position.

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Design Considerations in Selecting Teleconferencing for Instruction

Ellen D. Wagner and Nancy L. Reddy

As educators have searched for ways to improve access to college courses and programs, interest in making greater use of "high tech" instructional delivery systems has emerged as a top-priority issue in higher education. Teleconferencing serves as a prototypical example of how electronic instructional delivery systems can give greater access to existing instructional resources. Not only can teleconferencing stretch the availability of existing personnel, but it also can link geographically dispersed groups. Audioconferencing, audiographic teleconferencing, videoteleconferencing, and computer networking are electronic media which can be selected and adapted according to instructional needs, professional and technical expertise, and according to one's available budget.

Unfortunately, as pressures to deliver more information even faster to more people continue to increase, strategies used to attain such goals take a media selection approach described by some instructional designers as "hardware driven" (Wagner and Wishon 1987). Hardware driven teleconferencing decisions are based upon the premise that teleconferencing can perform virtually any task. However, just because teleconferencing is able to deliver interactive educational programming over great distances does not necessarily mean that teleconferencing is generically suitable for the delivery of all instruction, nor does it mean that all programs of instruction should be candidates for long distance delivery through teleconferencing.

A brief look at past trends in instructional media suggests that one must look beyond the media when seeking solutions to instructional delivery dilemmas. During the mid-1920s, educators predicted that Pressey's teaching machines would revolutionize education. Proponents of the visual instruction movement of the 1920s, 1930s, and 1940s suggested comparable impact of pictures, photographs, and films. Programmed instruction took the educational world by storm in the 1950s, and instructional television was perceived to be the panacea of the 1960s (AECT 1978). Microcomputers have had an enormous effect on educators during the 1970s and 1980s. Now teleconferencing (specifically video teleconferencing) is being hailed as the instructional technology of choice for the 1980s and 1990s (Zemke 1986). Each of these technologies has affected the way that educational practitioners deliver instruction. However, their impact tends to be greatest when they are viewed as components within the larger context of developing effective instruction, where instructional objectives have first been specified and constraints have been identified. In order for teleconferencing to be used to its full instructional potential it is important to determine the types of learning outcomes that are desired within a specific context before selecting one or another variety of teleconferencing media to attain the desired end.

Considerations for Instructional Message Design

It is also important to keep in mind that determining and specifying desirable learning outcomes are particularly significant in situations where one is concerned with *instructional* message transmission rather than with educational message transmission. Instructional messages are intended to elicit intentional learning or performance outcomes, whereas educational messages are intended to broaden one's knowledge or skill base without need to demonstrate whether or not learning has occurred. Educational messages tend to function more on incidental levels than on intentional levels. The importance of appropriate media selection for message transmission is apparent in both application arenas; however, the role played by the media differs between situations where one looks for intentionally derived outcomes and incidentally derived outcomes. Consequently, the need for deliberation is greater when working in instructional contexts than when one is concerned with broadly based programming of general interest.

One of the ways that one can efficiently select media on a "learning as outcome" basis rather than "media as stimulus" basis (Wagner and Wishon 1987) is to consider the entire system through which instructional messages are designed and transmitted. This can be seen as a four-stage process composed of a continuum of abstract-to-concrete, theoretical-to-applied, process-to-product activities.

Upon identification of a perceived learning or performance deficiency, one begins message-design investigations by considering the findings of experimentally derived research based upon theoretical learning constructs. The initial concern is to determine what the human learning capabilities may be with regard to the identified deficiency, and to establish an empirically sound foundation for subsequent developmental activities. If, for example, one were to consider human learning capabilities within the context of human information processing theory (Anderson 1985), one would probably begin the investigations by focusing upon research describing attentional, perceptual, or memory related phenomena. In doing

Table 1. Conceptual foundations for instructional message development.

Learning Theory	Instructional Theory	Instructional Development	Instructional Delivery
Describes Human Capabilities	Prescribes Treatment to Improve Outcomes	Tailors Prescription to Fit Situational Constraints	Transmits Messages
Attention	Prioritization	Analysis	Audioconferencing
Perception	Elaboration	Design	Audiographics
Memory		Evaluation	Video-Teleconferencing
Response Organization			Computer Networking
Response Generation			CBI/CBT
			Multimodal Formats
Abstract			Concrete
Theoretical			Applied
Process			Product

Source: Wagner, E.D., and K. E. Maxwell. 1987.

so, it is likely that a message designer will be more sensitive to the ways in which people extract information from the environment, how they begin to organize, label, and assign meaning to incoming information; and how they encode, store, and retrieve information for when it might be needed.

After considering specific capabilities of the learner, a message designer begins to consider prescriptions that will minimize or eliminate a perceived performance deficiency. The field of instructional theory is concerned with applying basic research to solve performance problems. It is aimed at telling people how to instruct rather than how people learn (Mayer 1981). Several approaches toward prescription development have been proposed. The prioritization approach, developed by Gagné (1985), suggests that message designers can use his nine sequential events of instruction as landmarks on the road toward effective instructional development. This approach is algorithmic in nature, and seems to be particularly effective when dealing with fixed task or variable fixed task instruction.

The elaboration model of instruction (Reigeluth 1979) is concerned with the structure and organization of material rather than with the specific material itself. It attempts to be consistent with research in memory and cognition. Elaboration is heuristic in its orientation. It proposes that instruction should proceed from the general to the specific (sequencing) and that each part of the instruction should be related to the general context and to other parts (synthesizing). Elaboration seems to be most effective when dealing with cognitive task instruction, particularly when one is interested in teaching a novice learner how to develop expert problem solving strategies.

After selecting an approach toward prescription development, a message designer must tailor prescriptions to fit specific situational constraints. This is where concerns for instructional development and design come into play. One begins, at this point, to deal with the exigencies of the specific learning deficiency that had been identified at the onset of the investigation. Does a learning/performance deficiency truly exist? What are the characteristics of the deficiency? What are the conditions under which the deficiency appears? What means may be used to eliminate the deficiency? What media are best suited to deliver the information to the target audience? Did the treatment work? What are the criteria used to determine the efficacy of the instruction?

A variety of models exist to represent the processes through which instructional needs are analyzed, instruction is designed, and is; ultimately, evaluated (Briggs and Gagné 1978; Romiszowski 1981; Dick and Carey 1985). Regardless of their specific configuration, most models specify activities within the stages of Analysis, Design, and Evaluation to accomplish their ends. This allows message designers to consider the "big picture" of message design while being sensitive to the concerns of the particular situation for which messages are being designed.

Finally — the message designer has reached the stage of development where concerns for the mode of instructional delivery may be addressed. To make the best determination of media appropriateness the message designer must look to the intended outcomes of instruction (Heinich, Molenda and Russell 1985). One way of assessing media appropriateness with regard for learning outcomes is to consider the types of learning experience one wishes to replicate through the medium or media selected. If, for example, one is concerned with transmitting abstract information, the tendency will be to make use of abstract media such as text, speech, or (representative) diagrams which may not physically resemble their referent. Other types of media will physically resemble the idea(s) that they represent; concrete exemplification through iconic means (where pictures, diagrams, film/video) makes learning experiences more meaningful *if the iconic representation exemplifies or illustrates the verbal message.* For many types of learning experiences, simply hearing about new information or seeing pictures of a new process may be insufficient means of getting a message transmitted effectively. Learners must have enactive experience with the newly transmitted information, where new processes are actually attempted by the learner.

Message Design for Teleconferencing

The message designer who is contemplating the use of teleconferenced modes of instructional delivery must consider potential outcomes of the instruction before selecting the specific variety of teleconferencing to be used; each mode of teleconferencing has unique transmission characteristics respective to its ability to replicate reality:

> *Audioconferencing* deals with two-way transmission of speech. It enables interaction among groups and is particularly well suited for discussions dealing with abstract information. Audioconferencing is well suited for the delivery of some higher education coursework for the same reasons that lecture formats can be appropriate. Lectures work if the audience is homogeneous, if information changes rapidly, if group composition changes rapidly enough to preclude the development of other modes of delivery, if a dispersed group can receive instruction at the same time, and if there is no need for enactive or immediate student evaluation (Sweeney and Reigeluth 1984). Unfortunately, the traditional — and frequently inappropriate — dependence upon lectures in higher education suggests that audioconferencing may be used in a comparable fashion.
>
> *Audiographic teleconferencing*, where voice transmissions are complemented by pictorial or data support, provides both verbal and visual modes of transmission. While verbal messages are well suited for dealing with abstractions, visual materials are better able to present concrete exemplification of verbal messages. Working together, the dual channel message transmission provides both abstract and iconic learning experiences. Facsimile transmission, telewriting systems, slow-scan video, compressed video, and downloading digitized information off disk enables the transmission of pictorial information (Kelleher and Cross 1985). These modes of transmission do deal on highly representative levels; however, their dual channel modality provides both abstract (verbal) and concrete (imaginal) exemplification.
>
> *Videoteleconferencing* provides transmission of a television signal from a point of origin through an encoder or "uplink" to a satellite. A satellite transponder strengthens the signal for transmission to a decoder, or "downlink." Accompanying the video signal are two-way audio signals which are carried across telephone landlines in a manner similar to audioconferencing. Videoteleconferencing provides one way (as well as two-way, if two separate transmissions are desired) transmission of a broad array of visual stimuli, which include full-range motion and color transmission as well as graphics, pictures, photographs, adjunct film/video, and digitalized data. The audio component permits interaction

between the originator and the receiver, although interaction may not be as spontaneous as with audio or audiographic teleconferencing because of the large number of sites/participants needed to make videoteleconferencing economically viable. Because of its ability to dramatize situations, to demonstrate procedures, or to simulate reality, videoteleconferencing may be most effective for special event, "ad hoc" programming, around which a course may be "wrapped."

Computer teleconferencing provides for the transmission of digitalized electronic information from one computer to another or through electronic mail networks by means of a modem and common carrier telephone lines. Computer teleconferencing is primarily concerned with the transmission of textual or graphic data. While pictorial information can be transmitted, verbal transmissions occur in written form. Computer teleconferences may occur where participants are simultaneously interacting, or may permit the transmission of information which can be accessed at the convenience of the receiver of the messages.

What are the factors which lead one toward choosing a particular type of teleconferencing? As suggested, one should first consider the attributes of the learning to be elicited so that the delivery system selected will emphasize those particular attributes. If you need motion to get a point across, then select a system which will permit the transmission of motion. If visual support is being utilized, make sure that the visual component of the message works to complement the verbal component of the message. If verbal interaction is required, but does not need to be complemented with a significant array of visual material, then perhaps audioconferencing will be sufficient to meet one's instructional needs. Secondly (or perhaps simultaneously) one needs to consider the relative expense of transmission/reception technologies within the context of the desired instructional outcomes.

Conclusions

The factors driving instruction message design should come from a holistic orientation which includes concerns for learning theory, instructional theory, instructional development, and instructional delivery. This is particularly appropriate when one is dealing with "high tech" delivery systems such as those used for teleconferencing. One reason for this is that less efficient planning results in less efficient products. Although the cost of teleconferencing technologies have decreased, when considering teleconferencing one is still looking at a sizable investment of time, personnel, and resources. Another reason is the rapidity with which technological products are rendered obsolete (Wagner 1986). Design-driven planning means that technologically based instructional delivery systems such as those used in any telecommunications paradigm will be established on a foundation of a generalizable planning strategy, and so will be more easily adapted as new technologies appear.

Greater attention to design-driven instructional teleconferencing decisions will insure that: (1) critical learning or performance problems are identified and addressed; (2) accurate goals are selected; (3) appropriate strategies for dealing with the learning and/or instructional problems are generated; (4) the best design to deal with a specific problem is employed; (5) the instructional message developed as a consequence of that design is transmitted effectively and efficiently; (6) the most appropriate message transmission technology is utilized; and (7) both formative and summative evaluation are possible (Wagner 1986). One can be more certain that instruction has been developed to address a real need, while also being certain that the technological means of instructional delivery are appropriate, cost-effective, adaptable, and efficient.

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Whose Job is Teleconference Reception?

Shirley Davis and Charles S. Elliott

Even the casual observer of business and educational video-teleconferencing is aware of the increasing use and the wide variety of ways in which satellite technology is being used: management communication, conferences and conventions, new product information, and continuing education and skills training. Both higher education institutions and high-tech industries were among the early adopters of educational video-teleconferencing. This interest was encouraged for educators by the 1982 formation of the National University Teleconference Network (NUTN) and, for industry, by the 1982-1983 successful series of engineering-related teleconferences from the Institute of Electrical and Electronics Engineering (IEEE) and the 1984 founding of the National Technological University (NTU).

The focus of this article is limited to educational teleconferencing, and specifically to full-motion video, continuing education programs delivered by satellite and augmented by return telephone line for interaction. This single focus represents only a portion of the national video teleconferencing activity, yet it is a significant activity affecting thousands daily. Even though the scope is limited to one medium, full-motion satellite video teleconferencing, and to one purpose, education, we are still not dealing with a single form of educational communication.

Teleconferences vary enormously. They vary in length from one hour to 45 hours or more, for a credit or intensive course. They vary in intent from skill-building, updating, teaching or attitude changing. They vary in production complexity from the informal candid classroom style to elaborate broadcast studio productions. Many are ad hoc programs like teleconferences whose audiences have been brought together electronically for a single occasion. Others are on-going programs, designed to reach the same audience time after time. Some are designed to be self-contained, requiring no special activities at the reception sites. Others require structured local instruction or discussion as part of the learning process. Some are marketed nationwide. Others are solely promoted through local efforts.

There is no "standard" format for educational teleconferences, nor should we wish for one. It is a dynamic medium experiencing rapid growth accompanied by widespread innovation. Creative producers continue to stretch the boundaries of the medium, providing effective educational programs previously unavailable to many people simultaneously.

With the numbers of programs and providers increasing and considering the variations in how the medium is being used educationally, an essential question is raised: How can an educational institution or a business organize its teleconference reception operations to best take advantage of educational teleconferencing to enhance its own educational programs? To gain a perspective, we will examine existing models in institutions of higher education and business, highlighting the necessary skills for successful coordination of teleconference reception. Next the models will be integrated to develop general observations, and the article will conclude with guidelines for organizational self-evaluation with respect to responsibility placement.

Teleconference Reception in Institutions of Higher Education

Given the increasing numbers of educational programs available in the mid-1980s and the price drop of reception equipment, many colleges were encouraged to buy into video teleconference reception. In the early years of satellite teleconferencing the promise was great, though naive: All you need is a downlink and successful programming is yours. As a result of no rules, few models, and no universal expectations based on experience, institutions aligned their reception operations in many different ways. That variety exists today as documented in a member survey conducted by NUTN in 1988. Of the fifty-nine responses recorded to the question, "What unit administers teleconference reception?" 54 percent (thirty-two) reported placing the responsibility in a department designed to meet campus media or television needs (e.g., Learning Resource Center, Communications Media Center, AV Department, Instructional Services, Media Services, Library); 40 percent (twenty-four) placed the responsibility in a department with an outreach mission (e.g., Continuing Education, Extension, Center for Professional Development, Community Services). A few other institutions (6 percent) placed the responsibility in a unit created solely for teleconferencing, in academic departments teaching communications, or in instructional departments.

Administrative Models in Education

Expanding on the results of the survey, we can offer four representative models for reception that exist from institution to institution; the models serve as useful generalizations.

Model 1A. Administrative responsibility rests in an audiovisual or telecommunications service unit. The program announcements arrive on a person's desk who understands the technology and is able to schedule the equipment. This person is often inexperienced in needs assessments, program development, and conference coordination. The announcement must pass to others who can make these decisions, including the amount of financial risk appropriate for a given program. Identifying the right person for each program and getting the announcement forwarded efficiently are not always easy, particularly when the responsibility is an "add on" to other pre-assigned jobs.

Model 2A. The program announcements go to a teleconference coordinator who is a part of a continuing education or community outreach unit. In this model 48 percent of the survey respondents (NUTN 1988) cited that the coordinator acts independently of faculty involvement at the institution. The teleconference coordinator often operates in an entrepreneurial mode, personally making marketing decisions based on local needs, developing appropriate local programs, making necessary technical arrangements, and promoting the teleconferences. Doing this successfully requires broad contacts within the community.

Model 3A. Actually a refinement and focusing of Model 2A, Model 3A places the responsibility in a unit created to serve a specific public; the most frequently mentioned in a survey were those serving business and industry. In this case, people who receive the announcements are prepared to act quickly; the marketing can build on established relationships with local firms, program buy-in can be direct, and the local wrap-around programming can be tailored to meet known or easily identified local needs. A problem arises, however, in that teleconferences not direct to the specific audiences served tend to be bypassed.

Model 4A. Again with the continuing education/extension as the home department, the responsibility may fall to a conference coordinator, with the rationale that coordinating teleconference reception is similar to coordinating a traditional conference. In this instance, interested faculty members in related academic departments, when they can be identified, are often involved in the initial evaluation and verification of the program, in the marketing, and in the local program design. Frequently, willing faculty, unfamiliar with the techniques for effective use of the medium, depend on the teleconference coordinator to take the lead in initial market assessment, local planning, and marketing. Experienced coordinators with well-developed programming and marketing skills are at ease with this role. In some instances though, particularly where a degree of skepticism about the future role of teleconferencing in the mission of continuing education exists, this responsibility is mistakenly given to the newest, least experienced coordinator.

Teleconference Reception in the Business Environment

How do businesses and industries optimally organize to use and receive the greatest value from teleconferences for their organization? What are typical problems they encounter?

A Place for Teleconferences. Industries, especially high-tech ones (IBM, Hewlett-Packard, Texas Instruments, etc.), have been in the forefront of training their staff to keep current with changes in technology through both formal and informal continuing education activities. Prior to the era of satellite distribution, many industries had well-established local receive sites for university-based television networks involving ITFS, or point-to-point microwave television links; since the 1960s over thirty major colleges and universities have developed regional TV networks to serve engineers in industry (Baldwin and Down 1986). A compendium of such systems published in 1985 and updated in 1986 reviewed thirty-one university operations, nine industries, two professional societies and four consortia participating in TV instructional activities (Chenette and Biedenbach 1985; Atkinson et al. 1986). These regional efforts led to the 1984 formation of the National Technological University, a non-profit institution of twenty-five engineering schools, which offers master's degrees in five engineering areas and many noncredit programs by satellite. It reached more than two-hundred company sites in the fall of 1989 (National Technological University Bulletin 1989). To many businesses teleconferences seemed to provide both a logical extension of "live" programs and a potentially cost-effective way to reach large segments of the total company work force.

Business Firm Approaches to Teleconference Administration. Similar to our previous review of teleconference administration within universities, we also identified four representative models used by United States businesses and industries. While variations exist, these serve as useful generalizations.

Model 1B. Existing training/education departments are assigned the responsibility for teleconference administration. Often unfamiliar with the medium, these staff members can be qualified, given their backgrounds in adult education, learning theory, teaching, instructional development, and related areas. They often run extensive internal training programs, with both "live" and media-based presentations. They may have established internal needs assessment processes available, as well as existing internal promotion systems (e.g., mail, bulletin boards, key contacts, and electronic bulletin boards). However, if they possess limited subject matter understanding, a situation that occurs especially with high-tech topics, these individuals may be poorly positioned to maximize company usage.

Model 2B. An individual operating manager may be given the responsibility. This occurs especially in medium-to-small-sized firms without formal training offices or where an engineering or manufacturing manager may have provided the leadership for getting involved with teleconferences. This may mean a significant change in responsibility for the person(s) involved. This can often be successful—especially when the activity is focused in a major segment of the firm (accounting, engineering, etc.) where a large potential "audience" is located.

Model 3B. Some organizations (e.g., government agencies) and large industrial firms have long-established, fully functioning professional development committees that can be assigned teleconference administrative duties. They may have a support staff available, use a training office, or use other staff member resources in the operating departments.

Model 4B. Many small firms utilize a key individual who may have been the primary initiator for teleconference reception. It may be an individual engineer who learns of the availability and is initially willing to lead the project by obtaining management approval and acquiring the necessary equipment and funds. This type of operation can quickly outgrow the person's available time unless a job change is provided. This model has proved to be very effective in establishing initial impetus in a firm.

While Model 1B, using the training department, has become the most commonly adopted, its structure needs to be tailored to the size of the firm, and to the leadership capability and resources available to ensure internal success.

Operational Challenges and Issues in Both Environments

Why look at these models? What can be learned from them? Can they help us understand why some institutions use teleconferencing as a successful educational activity that is more than self-supporting? Can they help us see why others, with the same teleconferences available to them, are struggling with the medium? Or can reviewing the models help increase reception effectiveness in business?

The models are useful for expanding administrative perceptions concerning who should be responsible for teleconferencing reception. There is no one right solution; no model universally superior to the others.

Instead, the key is to review the requirements of teleconference reception and ensure that the necessary support is provided.

Regardless of the organizational system in place, participation in teleconferences provides several internal challenges. First among them is establishing an effective point of contact or responsibility. In the early days, producers of teleconferences would blanket business and industry firms enticing participation either at external contracted sites or a site within the firm. Most firms quickly learned that having a central contact point was usually the best approach to keeping in touch with what was available and comparing offerings. But it is essential for that single person to be well positioned and well supported. Dr. E. Marie Oberle, Director of NUTN, recently announced that NUTN was beginning to use a "saturation model" for getting program announcements to the right departments on campus (NUTN 1989). This move suggests that not all institutions are aligned for effective internal communication and that having a single point may not, in itself, be all that is required.

A second major factor is the internal process for deciding which programs to subscribe to and on what basis. This is an increasingly difficult task as the number of teleconferences now exceeds the "novelty" threshold. Who in business can best decide? Training, operating managers, committees, or plant managers? Many companies lack internal needs analyses and cannot quickly assess who needs to learn about a subject, whether there are enough employees to justify participation, and whether they have the time, interest, and management support to participate. Who in higher education makes the decisions: the equipment schedulers, program coordinators, faculty, and outreach specialists? Who will take the risks?

Having decided to participate in a teleconference, who is to coordinate it? The same people who decided to take the program or is another office (existing or created) given basic operational authority? This task would include acquiring facilities, promoting the offerings (a major undertaking), interfacing with the program producers, organizing the highly important component of a local wrap-up segment, acquiring and distributing handout materials, monitoring the actual program, conducting evaluations, reporting back to producers, and performing the myriad other responsibilities involved. Obviously, most coordinators cannot be knowledgeable about all the subject-matter areas. Internal or external "content experts" must be identified and involved for maximum local value.

Another major issue to face is how to pay for teleconferences. Except in the case of a small number of "free" offerings, a site license fee or individual participation fee is usually required. In higher education, will the academic department pay, will costs be covered by enrollments, or will an external sponsor be sought? In business, will a central budget cover such a cost, or will a charge-back system to the departments be adopted? Keeping records and paying the bills can become a time-consuming set of responsibilities.

Bringing It All Together — Learning Through Teleconferences

In order to make the best use of educational teleconferences, it is important to understand fully the nature of this medium. Many assumptions are based on the belief that it is the same as business teleconferencing, broadcast television, or independent study. On closer scrutiny, we must recognize it as an entirely new educational medium with a different set of requirements.

First, to echo an idea presented earlier in the paper, what we are addressing is teleconferencing for education, not business meetings. The misconception that they are the same is fostered by the fact that often the same technology is used for both purposes, and, unless trained to recognize the differences, both the users and the administration may view them as the same.

Another misconception is that teleconferencing is like broadcast television, an attitude furthered by the natural predilections of the television producers who launched educational teleconferencing. Much attention was given to production quality and to delivering the program, as it must be, but little attention was given to the reception requirements of the programs or the viewers' readiness to learn from the program.

Although discussing educational broadcasting and not teleconferencing, Kozma makes some important observations about the nature of learning from television that point the way to effective use of teleconferencing as an educational medium. He encourages broadcast producers to focus on individual learners:

> Learning…occurs in the individual, not in the aggregate…Design the production as if there was only one viewer. If this one viewer learns, the production was effective. If this individual occurrence can be multiplied by millions of viewers, the production was a success (Kozma 1986, 12).

Whether or not educational television producers (or even teleconference producers) have learned that lesson is irrelevant here; the lesson teleconference coordinators need to heed, however, is the importance of each individual viewer since it is on a personal level that learning occurs.

Ironically, just at the time when we were wooed into the idea that this efficient medium could provide education to thousands of people at a time, learning theory reminds us that education is more than broadcasting to large numbers.

The focus on the individual in the learning process is evident in the writing of many others. Gagné gives us much to consider through his discussions of learning as a "change in human disposition or capability that persist over a period of time..." and the identification of the "encoding" or "internal processing" that takes place in individuals as they move information from short-term to long-term memory (Gagné 1985). Kozma applies the same line of thinking to broadcast television:

> Information in short-term memory decays within a minute if not rehearsed. But this rehearsed information competes for the limited memory capacity with new information and with information retrieved for current use from long-term memory. ...The longer information stays in short term memory or the more it is operated on or transformed there, the more likely it will enter long-term memory (Kozma 1986, 13).

Therefore, not only is learning an individual act, it is one that is affected by the amount of time spent in operating on or transforming the information. Ironic again, that this technology, which has promised a saving of time and is energized by the rapid, efficient delivery of information, appears at odds with the requirements of learning. This is an important observation for those who coordinate the reception of teleconferences. Learning takes time and thought.

What should teleconference reception coordinators do to enhance the learning process? Both Gagné and Kozma provide us with guidance in improving the learning process and guidance that translates in the teleconference world to providing good local wrap-around programs. Learning theory again supports the need for both readiness to learn and mental focus on the part of the effective learner. Gagné lists "alertness" and "selective perception" as two of the external events that are key to getting information into the short-term memory, the first step of the learning process (Gagné 1985, 80-81). The teleconference coordinator has a role to play in both encouraging the learners to overcome, if necesary, passive television-watching habits and in outlining the educational objectives of the program. Wohl and Tidhar, in their discussion of AIME, the Amount of Invested Mental Effort, point out that:

> Preconceived notions as to the kind and depth of processing necessary for getting the message from a given medium dictate whether the receiver actively or passively "turns on" or "turns off" the type and level of processing desired. Thus, the quantity and quality of viewing and the final message received is determined, to a large extent, by the quantity and the quality of processing activated (Wohl and Tidhar 1988, 12).

The practice, therefore, of "warming up" the audience before a teleconference and focusing their attention and expectations are well rooted in theory.

Again, learning theory would suggest that learners be given opportunities to manipulate, organize, question, generalize, and work with the information presented in a teleconference. Gagné points to the importance of feedback and reinforcement, which "serve to fix the learning," or put it into long-term memory. Often the teleconference itself is highly compressed and cannot provide the reinforcement; it becomes the responsibility of the local coordinator to ensure that the opportunity for reinforcement exists. Kozma points out that these processes "are automatic for some learners, but they are not automatic for inefficient or inexperienced learners." Furthermore, even today's efficient learners may need encouragement to rethink and apply what they learned. In our busy world, time for contemplation is often lacking.

There has been much discussion about wrap-around activities and lists constructed of what is required, from refreshments to a warm handshake. Young lists the following services as desirable: "parking for the participants, a conveniently located meeting room that is both comfortable and adequately equipped, the availability of a telephone for interactive meetings, a coordinator on-site to act as host and troubleshooter, and food service" (Young 1984, 15). Pirkl has designed a list that appropriately extends beyond Young's list to include other elements: personal greetings, get-acquainted activities, a "wonderful buffet lunch," and the personal touches needed for everyone to be "primed and ready to participate actively, not passively" (NUTN 1987).

There is little data that conclusively demonstrates the importance of the wrap-around program to the learning process, but there is also little doubt that participants give higher evaluations to teleconferences with strong local programs. For example, in the standard evaluation of an April 1989 teleconference originated at Purdue University, participants were asked to evaluate on a six-point scale both the local program and the overall program. Based on the ninety-six site evaluations that contained responses to both of the questions, where the local program was rated low (0, 1, or 2), the overall evaluation was 3.4 or less; where the local program was rated high (3, 4, or 5), the overall evaluation was 3.8 or higher. While some halo effect is likely because of the way the questions were asked, the correlation is still borne out. We need to acknowledge that these data represent a "happiness index" and not an evaluation of learning. Furthermore, they were not collected specifically with the intent of evaluating the effects of the local program. There is need for more focused study of these elements of teleconferences, especially as they affect learning.

It is clear that successful teleconference reception is not a case of aiming the dish and turning on the monitor. It requires leadership and coordination at the local level to assess local audience needs and reactions. It requires someone who has the judgement, courage, and authority even to turn off a program if the local audience is not benefiting from it. This is an audacious act, but necessary if individual learning at the local level requires it.

Requirement for Personal and Institutional Support

Because of the newness of the medium, administrative support systems have tended to evolve rather than to be carefully planned in advance. By reviewing these existing models and considering the nature of the teleconferencing medium, it is possible to draw up the "ideal" personal and institutional resources needed for successful teleconference reception. This is an ideal list because there has been little research completed to isolate and quantify the effects of the various elements. The danger, of course, in looking at the "ideal" is attempting to do everything perfectly and completely every time. But as in other activities, experience is the best guide to identifying where corners can be cut and where appropriate efficiencies can be gained without serious loss

First to be addressed is necessary personal resources. They may not reside in the same person but need to be available among members of the reception team:

1. An understanding of the basic technology of satellite delivery and interaction practices so that there are no technical mistakes and so that participants can be instructed to make effective use of the audio feedback.

2. An understanding of the principles of adult education and the ability to apply those principles to ensure that the local programs can be designed educationally effective.

3. Ability to develop and evaluate effective adult education programs, including a willingness to become immersed in the subject matter, if not

already knowledgeable about it, and take a creative program development stance with subject-matter experts often unfamiliar with the medium.

4. Knowledge about the needs of the target audiences to facilitate efficient assessment and marketing of teleconferences.

5. Skill and style in program promotion using a variety of approaches; the direct-mail brochure is not always the best approach.

6. The ability to be a team player, linking easily with program originators, local program resource people, and technical support personnel.

7. An entrepreneurial spirit; someone who enjoys getting involved and taking risks. The generalization has been drawn that "Continuing education providers resist complex systems requiring unfamiliar and unavailable resources or expertise" (Spencer 1986, 149). The teleconference coordinator in business or higher education needs to be more risk-taking and confident than most.

Providing the right organizational support is also critical to the success of the program. As we knew from the start, technical facilities, technical support, and meeting room space are needed. We have learned in the intervening years that there must also be adequate time in the person's job to work with this new medium, to approach it constructively, and help it fulfill its potential in meeting local needs. There must be a clearly defined way to pay for the programs and risk capital available so that chances can be taken without harmful effects. There needs to be a single, effective point of contact. This person, ultimately responsible for the teleconferencing, must be at a high enough level and experienced enough to select the best programs and to interpret the medium successfully to novices. There must be accountability for doing the job right. Duning (1989) identified a situation that exists on many campuses due to a lack of a track record for teleconferences: inadequate accountability for the operation of the program. The same may well be true in businesses and industries. The medium now has stabilized enough and there are enough experiences among those receiving teleconferences for this to no longer be the case.

Some Suggested Guidelines for Teleconference Administration

Regardless of what part of a university or business firm is given responsibility for teleconference administration, the following elements need to be given careful attention and resolution to ensure successful use of this still relatively new educational tool:

1. *Audience.* Be certain that you can identify the correct audience and that it is available, willing, and reachable; that you understand what they

need to learn, know that the teleconference can provide what they need, and know what other alternatives are open to them.

2. *Timing.* Make sure you have enough time to successfully prepare for and conduct the teleconference, both lead time and working hours. Many program announcements arrive too late for us to do the job right; NUTN, however, has faced this need over the past several years and has made significant progress toward providing adequate lead time. The other time-related question is an administrative issue: Be sure the coordinator is not so burdened with other things that the job cannot be given the attention it requires.

3. *Content experts.* If you do not know the subject matter well, be sure to have interested, willing faculty or staff members available to you. If they require "payment" (in whatever form), be sure you provide it. A local "wrap-around" is almost always needed. Can you provide a good one?

4. *Provider Contact.* Do you (or your content experts) need more information about exact content, program objectives, assumed prerequisites, schedule, handout materials, etc.? If so, by all means contact the program provider. Unanswered questions can be your downfall.

5. *Administrative Control.* Know who is in charge. Individual accountability is important even though the medium is new. Be sure you have enough support staff and flexibility in financial resources. Committees can be very helpful, but often when "everyone is in charge," no one is! Mechanics such as registration, handout preparation, and fee collection are usually required.

6. *Facilitator Role.* During the teleconference, someone needs to open the program, lead local input, and aid in the question/answer call in operations. Long distance phone calls are often involved. Make them easy for your audience.

7. *Evaluation.* Most providers send out evaluation forms. Add items of your own. Strive for maximum return from participants and send results promptly with your comments to the producers. How about long-term evaluation? Consider three-month and six-month follow-up evaluations. Have the participants used the knowledge; do they still have it? Where there any changes or improvements because of the teleconference?

8. *Feedback.* Provide appropriate information back to all who have had a stake in the teleconference, such as producers, participants, your top management, committees who were involved, and faculty. Also, report needs not currently being met by teleconferencing to producers and organizations such as NUTN, NTU, and others. They cannot help you and your organization without your input.

Conclusion

The fact remains that educational teleconferencing is an evolving medium and has not yet become what it can be. In higher education problems exist with local acceptance of programs, with local marketing of programs, and with achieving optimum learning. In business, program efforts are now generally undertaken by education/training offices. As they have established closer working relationships with operating managers and/or representative committees, the effective use of teleconferences has gradually improved. Admittedly many weaknesses still exist.

Moore names video teleconferencing as the powerful new medium of American distance education in the 1990s (Moore 1988). If this prediction comes true, and all the evidence would point that way, it is important that organizations reevaluate now the administrative support they give to teleconferencing. The requirements and guidelines presented in this article may be used as the starting point for an organizational self-evaluation for teleconference reception and the framing of an appropriate local answer to the question, "Whose job is teleconference reception?"

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A Navy Video Teletraining Project: Lessons Learned

William L. Maloy and Nancy N. Perry

From Congress to statehouses, from universities to military schools, Video Teletraining (VTT) is a distance learning technology looking for a mission. Yet, unlike many of its equally flashy predecessors, it will find one. Its cost is going down even as the need for diversified learning opportunities escalates. Further, there are growing examples of VTT's multiplier effects. Exploiting these effects could restructure the schooling process throughout the nation.

The Navy VTT initiative has emerged with this potential in mind. The present economic climate only highlights what has long been the case in the military. "Better, faster, cheaper" is a training imperative:

- Better use of technology amplifies the trainer's ability to meet the educational and training needs of sailors.
- Faster delivery of training sends these sailors to the fleet more quickly to assume their responsibilities in that sophisticated operating environment.
- Cheaper application of technology reduces training's travel cost and labor intensiveness.

The burden, then, is to structure the use of VTT to magnify its contribution. This paper discusses lessons the Navy learned in this regard during the development of an overall VTT implementation plan. It focuses upon policy concerns, instructional matters, and management issues. These issues led the team responsible for developing the Navy plan to recommend an architecture they believed would best meet Navy training requirements: a VTT system, which included secure, digitized, two-way video and audio, for teaching formal Navy courses in designated areas of specialization. In addition, the paper points out why those with different requirements for a VTT system should consider their own situations before making network decisions.

Policy Concerns

Interdisciplinary Approach. Several Navy organizations are responsible for different aspects of teletraining. An interdisciplinary team from these organizations was required to examine the training and cost effectiveness of VTT in the Navy environment, and to articulate factors to be addressed in a Navy-wide implementation plan. Table 1 describes the contributions of team members to the process.

Table 1. Contributions of Video Teletraining Team Members

Discipline	Role
Education Specialist	Design and develop instructional strategies; monitor training effectiveness
Engineer	Prepare system architecture; evaluate equipment for meeting VTT needs
Budget Analyst	Review cost data; ensure cost effectiveness is properly reflected in budget requests
Audio-Visual Specialist	Assist in preparing documentation for system approval
Security Specialist	Recommend system configurations and equipment to meet privatized or secure network requirements
Researcher/Analyst	Analyze system reliability; evaluate cost/training effectiveness; conduct literature search; develop course selection model
Resource Sponsor Representative	Provide overall policy and oversight; support funding requirement at Washington level
Representatives from: Civilian Personnel Fleets Training Command Reserves	Give input from, and review plan on behalf of, represented organization

Policy Overlap. In big bureaucracies many regulations exist for particular reasons, if not for the right reasons. When dealing with emerging technology-based instructional programs, most rule makers exert control to protect what they perceive to be their own organization's interests. They seldom consider that their decisions affect learners or the integrity of learning systems. At times different, and sometimes conflicting, regulating policies of at least three organizations sidetracked the team's planning effort. If, for example, instruction is transmitted from one site to another, the Defense Communication Agency proclaims its authority to determine the conduit. The addition of a computer at either end convinces the Navy Regional Data Automation Command that it is the group with overall control. Putting a television screen on top of the computer makes the Navy Imaging Command want to take charge. In all three cases, those involved have no expertise in the teaching-learning process. Furthermore, they were not the least bit interested in accepting responsibility for learning outcomes. Yet, they cluttered the effort to design the best system for meeting training needs.

In this Navy initiative, trained performance is the intended outcome. This requires integrated policy which ties this outcome to the specifications of the learning system and governs the accountability of the organization in charge. That organization should always be a Training Agent. As new technologies emerge, educators at the state and local level also must give greater attention to policy that supports instructional applications. Otherwise, as in the Navy, those who have little interest in learning will unduly influence their use.

Investment Initiatives. U.S. policy makers must develop new ways of looking at investment initiatives. In the Navy, program managers are leery about claiming investment savings. Regrettably, outyear projections often find their way into this year's cuts. Last year (1990), for example, Congress decreased the Navy's travel budget by thirty million dollars because of perceived misuses of teleconferencing, use of which should have brought travel savings. This translated into a $700,000 "fair share" loss to the Naval Education and Training Command.

What if Congress had earmarked this money for VTT incentives grants that required audit trails? The Training Command could have amortized $7.7 million within three years. The next three years would have yielded one hundred per cent of the original investment. Moreover, the level or quality of training would have remained the same. On the other hand, training suffers from reduced travel without an alternative delivery system.

Policy makers and budget analysts at all levels must learn to be patient about investment returns. They must support instructional innovations to realize long-term payoffs. This is no time to be dismissing promising ways to close gaps in human performance. Rather, decision makers must champion learning technology as vigorously as they do weapon system procurement and stadium construction.

Evaluation. Educational policy must assure the evaluation of instructional systems operating with public money. Evaluation can clarify the destination, as well as the best route to follow. Furthermore, it can add to a much-needed body of knowledge about factors which affect cost and learning. The importance of these contributions became clear to the VTT team early in its deliberations. As it searched for precedents to guide the design of the VTT system, it found few rigorous assessments of earlier efforts. So, for the past twenty-four months, team members from the Center for Naval Analyses have studied student performance at remote and originating sites (Rupinski and Stoloff 1990; Stoloff in press). Each successive evaluation confirmed that students in all classrooms perform similarly at the end of the course.

This review suggests that thorough assessment of new technology applications should address another important matter. Evaluators scrutinize technology-based instruction for its ability to meet performance and cost criteria but frequently ignore whether present methods meet these criteria. Examination of all, not just new, alternatives must guide instructional decisions.

Instructional Considerations

Instructional Strategies. Experience with the Navy's prototype system confirms literature findings (Bailey et al. 1989) in two specific areas: the retraining of instructors for the VTT role and modification of the course's graphic materials to match the delivery system. The Navy also found that support services must be present to assure student motivation and performance.

Teaching techniques that are effective in a single classroom do not automatically transfer effectively to a VTT setting. For example, VTT instructors must learn new communication styles and body language appropriate to maintaining contact with distant students (Hudson 1988). Holt (1989) recommends that instructors become dynamic, first-rate actors who are also subject matter experts. Instructors must also learn to encourage student interaction at remote sites with deliberate techniques.

such as asking distant students as many questions as they would ask in a "live audience."

An error made in the first weeks of a Navy demonstration project was failure to modify graphic support. Instructors thought they could continue to use the same transparencies that had served them well in illustrating their on-site course content. They soon learned that special care in the design and delivery of visual materials is necessary if remote students are to have equal access and legibility.

Another serious concern is the effect of number of sites and class size on learning. Though "the more the better" appeals to fiscal analysts, its literal application endangers learning. Managers cannot substantially increase the number of learners in multiple sites unless they simultaneously augment instructional support systems. These include on-camera "office hours" for remote students, on-site subject matter experts, peer tutoring, VTT small group exchanges, and learning centers. These support systems are a hedge against depersonalization, with its attendant declines in performance.

In summary, VTT learning strategies must assure that the instruction includes new roles for the instructor, new designs for graphic materials, and new support systems applications. Achieving desired results depends upon the wise use of these innovations.

Instructional Integration. Instructional integration is the most challenging aspect of the application of technology to learning. It builds upon the support system concept discussed above, and blends processes to facilitate each student's learning pattern. Combinations of individualized instructional packages and interactions among students and between students and instructors can help learners avoid fragmented instruction. Instead, these combinations provide a continuum for achieving and maintaining learning outcomes. VTT has the potential to support these processes.

The power of technology-based integration deserves careful attention in both civilian and military arenas. Through it, educators can move beyond the limitations of "talking heads" toward an effective, interactive learning system.

Professional Development. VTT offers, for the first time, a cost-effective way to provide professional development. This is attractive to the Navy's Training Command, which has initiated a project to increase the use of good instructional techniques in Navy schoolhouses. Staff development is essential if this project is to succeed. Through VTT networking, people can also learn from and support each other. Because it is not dependent on travel. VTT offers a way of using technology to train the trainers better, faster, and less expensively.

Management Considerations

The VTT team uncovered management issues which appear simple on the surface but which must be addressed in anything but a simplistic manner. These considerations range from scheduling requirements to system maintenance.

Scheduling. The integrity of a VTT system depends on the scheduling process. Training must be the top priority and the scheduler must prepare to defend against disruptions. A last minute call from "Mr. Big," who wants to hold a teleconference that would override a scheduled training session, must not prevail. The scheduler, however, should be proactive and reinforce emerging interest among important officials by offering them other time slots.

Perhaps this problem surfaces only in hierarchical organizations such as the military. Still, the lesson is generalizable: interruption of orderly, planned instruction should occur only in an emergency.

Life Cycle Management. Planning for a VTT system must include strict attention to managing and supporting the technology throughout its useful life, i.e., five to seven years. This life cycle management concept is as critical to VTT development as are good performance data (Rupinski and Stoloff 1990). To understate the dollars required to operate, maintain, upgrade, and train to the system is to undercut its assimilation into the instructional process. When this happens, technology remains supplemental, making it even more vulnerable to cost reductions.

Furthermore, life cycle management design affects other decisions critical to the management structure. Whether to contract for or use inhouse personnel is one such decision; whether equipment should be leased or bought is another.

In the defense establishment, a system dependent upon hiring more inhouse people is unrealistic. Therefore, the VTT team planned to contract for system facilitators, operators, and maintainers. The civilian sector may find another route more advantageous. Some organizations can factor in management flexibility, work force stability, and greater control over operating costs. Under these circumstances, they may decide to develop their own workforce.

System requirements pointed to an approach combining the leasing and buying of equipment. Initially, it appeared the Navy would achieve the most cost-effective system by leasing satellite time and land line services while purchasing uplinks, downlinks, and operating equipment. With leasing costs paralleling the downward trend of equipment costs, the purchase advantage is less clear today. Maintenance and obsolescence must be added to the purchase side of the ledger. At this point, saying to the contractor "take out the old and bring in the new" can be quite appealing. Organizations with a choice will want to avoid preconceived ideas and to perform a thorough cost-benefit analysis.

Centralized Versus Decentralized Control. Finally, the degree of centralization reflects management philosophy about flexibility provided to the primary users. The Navy's planned system includes three interconnected networks (East Coast, Central, and West Coast) paralleling the distribution of fleet- and shore-based training sites. This optimizes regional training, yet permits instruction and conferencing throughout the widely-dispersed training community.

System Architecture

The Navy's VTT architecture has resulted from a desire for a building-block system, network interoperability, and flexibility to prepare for the future. Educators must avoid dependence upon rigid ways of meeting today's requirements or upon current technology. Change is coming too fast! The issue, however, is not one of obsolescence alone. It is also one of prudent configuring based on balancing cost and needs.

In trying to achieve this balance, the VTT team began system architecture deliberations by applying the primary design goal: the VTT system must support the Navy with effective training accompanied by reasonable cost savings. For each option the team asked: "Will training be as good as it is now?" When the answer was positive, near-term and long-range cost estimates followed. The following is a list of architectural options considered.

- Analog or Digital Equipment
- Simplex or Duplex Video Channels
- Satellite, Terrestrial, or Hybrid System
- Classroom or Individual Workstation Configuration
- Single or Multi-Channel Network

From this exercise has come the rationale for the design described below.

Analog or Digital Equipment. Navy training requires a privatized transmission capability; it is not in the nation's best interest to have Navy course content available to anyone with a satellite dish. The review of courses for potential delivery by VTT revealed many with classified objectives (McDonald et al. 1990) indicating that a secure system was necessary. Because of this, the team selected the digital equipment required for secure transmission.

Some industries have similar reasons for not openly broadcasting their training programs. Schools may not share this concern; there is no way for a person to receive credit by just viewing English 101. Therefore, other factors, such as reliability and cost, may be more important in their equipment decisions.

Simplex or Duplex Video Channels. The VTT team selected two-way video for the prototype network. This is clearly necessary for "hands on" courses in which students must demonstrate their operating or maintaining abilities. The Navy teaches enough of these courses to make two-way video the preferred presentation method in the plan, although it costs more than one-way video (Simpson, Pugh, and Parchman 1990). Most Navy VTT training, however, is more similar to lecture-based courses delivered successfully by academic institutions using one-way video combined with two-way audio (Keene and Cary 1990; Fisher 1988). A controlled study to examine the applicability of this method to Navy training is underway. If acceptable, some reconfiguration may be appropriate, but use of simplex systems would significantly reduce transmission costs.

Satellite, Terrestrial, or Hybrid System. Two events divided the team into satellite proponents and terrestrial proponents. A sudden disruption of training during a NASA launch caused some to mistrust the reliability of satellites. Soon after that incident, a backhoe severed a T-1 line during an East/West Coast conference, turning others against land lines. Personal preferences aside, these events were rare occurrences. Both satellite and terrestrial transmission are reliable, but neither is perfect. Therefore, the Navy will take advantage of existing terrestrial cables and supplement them with satellites where required.

Classroom or Individual Work Station Configuration. The initial Navy VTT system will use regular classrooms. Work station configuration and management are still in a developmental stage for the Navy. Still, work stations deserve attention because they promise to link group-paced instruction with individualized learning. VTT offers economic and quality control benefits but remains, primarily, a "talking head" technology delivered in a classroom setting. Work stations focus learning on individual needs. They can assess a person's mastery of the group-paced instruction, tailoring remediation as required. In addition, they can provide follow-on learning at a time and in a place convenient to the learner. Finally, they can simulate hands-on training which complements both group-paced and individualized learning. In short, work stations are the next technological link in the Navy's learning continuum. Integrating work stations with VTT will extend teaching and learning beyond a single schoolhouse dependency.

Single- or Multi-Frequency Network. Determining the system size should begin with documented near-term needs and long-term growth projections. Cost considerations include whether to overbuild the system initially and grow into it, or to add sites and frequencies when saturation is close at hand. The more prudent alternative is to size the system to immediate needs since additional frequencies cost the same when purchased separately. However, sometimes a window of opportunity dictates buying for future needs while money is available.

There is a common thread throughout this section. A thorough front-end analysis is essential to identifying system requirements. The prudent use of resources also demands that these requirements be met in a cost-effective manner. Presumably, an existing delivery system would best meet this criterion. The Working Group assigned to develop the architecture at first examined the existing Defense Commercial Telecommunications Network (DCTN), which they hoped would provide for the identified requirements. It did not. Furthermore, training's time-intensive demands would have overloaded DCTN, which was originally designed around intermittent conferencing needs. This led the group to believe that a design similar to the prototype's would provide the preferable operational system. It would require both a Department of Defense waiver to allow for a new system and competitive bidding to assure cost effectiveness in a rapidly changing technological field.

Since the Working Group completed its deliberations, DCTN has continued to mature, incorporating most, but not all, technological advances that support training requirements. Furthermore, it now will permit training and conferencing to be carried on simultaneously. If all the critical training requirements can be met in a cost-effective manner, a Navy training capability will emerge within DCTN. Otherwise, it should not be the system of choice, and the Navy training community should seek an acceptable alternative.

The Future

This article makes an effort to communicate Navy lessons in VTT implementation to a national audience. The most important of these lessons relates to the use of talent. Those who work for VTT development must have the skills to do the tasks at hand and a vision of "what could be."

This vision is the key to the future. The cost of continuing to replace a professional work force on a one-on-one basis is staggering. So, too, is the need to structure multipliers that equalize educational opportunity. Furthermore, integrating VTT with simulation and artificial intelligence offers a promising road toward the next generation of learning technologies. Those who see the future must carry learning beyond the boundaries of today. The challenges of tomorrow demand a higher expectation from "what could be." However, getting started toward this goal goes well beyond the application of the technology itself. VTT's ability to promote change depends on people's willingness to demand change throughout the learning enterprise. Those with vision, who sense an opportunity, must turn their efforts toward making it happen. They must convince the people that schooling must be everywhere and be everybody's job: a lifelong learning "manifest destiny" for the twenty-first century.

Once this vision is reality, broader application of distance learning technology will take care of itself. New technologies will tie together old ways and new frontiers. At last, the national imperative of lifelong learning can be achieved. What better gift can this nation provide its future generations?

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Effectiveness of Distance Education Approach to U.S. Army Reserve Component Training

S. Delane Keene and James S. Cary

Reserve Component (RC) units are taking responsibility for an increasing portion of the national defense mission. Additional training requirements are imposed in preparation for this challenge. These training requirements are difficult to satisfy due to the limited amount of training time available for RC training—only thirty-nine days per year for both students and instructors.

Dispersion of RC units also presents difficulties for training. RC units are geographically dispersed over 4,600 locations with an average of 105 miles between them (USATB, 1988). RC training support facilities are hundreds of miles and hours of travel time from home stations. Travel reduces the effective training time available to somewhat less than the thirty-nine days allocation and incurs substantial transportation and per diem expenses. Civilian education centers with student problems similar to the RC (dispersed population, limited time to devote to education) have been increasingly turning to distance learning technologies, such as interactive video teleconferencing, computer teleconferencing, and audio-graphic teleconferencing to deliver instruction. The study reported here was designed as a preliminary evaluation of a "package" of these three distance learning technologies for RC instruction. Studies which examine combinations of available technologies are scarce—most research examines the media individually. The following paragraphs provide a brief review of selected studies.

Haarland and Newby (1984) found that certain effective teaching behaviors were performed more frequently by instructors teaching via video teleconferencing than by instructors teaching via conventional classroom method. These effective behaviors were (1) using students' names, (2) setting clear statements of purpose, (3) using printed material, (4) encouraging discussion, and (5) not speaking in a monotone voice.

In a study by Kruh (1983), courses taught by video teleconferencing were compared to courses taught in the conventional classroom manner. Kruh concluded that participant satisfaction in the teleconferencing classes was high and academic achievement in these classes was equal to that of students in the conventional classes. Partin and Atkins (1984) reported similar findings in their study which used teleconferencing to deliver instruction from the U.S. Army Logistics Management Center. Also, Western Illinois University evaluated the effectiveness of non-interactive video in presenting economics instruction and found that students taught by this method scored significantly higher on learning outcome measures than students taught in a traditional lecture course (Grimes, Nielsen, and Niss, 1988).

DeLoughry (1988), who examined computer-based teleconferencing as an educational medium, found that students taught by this means believed the use of this technology: (1) improved the educational quality of their course, (2) made access to education more convenient, (3) involved them more actively in the classes, and (4) improved their access to their professors. Additionally, students taught by computer teleconferencing did as well on learning outcome measures as students receiving conventional classroom instruction.

AT&T, reporting the results of a study that examined the effectiveness of audio teleconferencing in the delivery of a variety of courses (Fahl, 1983), concluded that students taught by this method do as well on learning outcome measures as students receiving resident training. The students also reported a good overall attitude towards audio teleconferencing as an educational medium.

For purposes of this demonstration, the educational plan used interactive video teleconferencing to deliver material for which the lecture or discussion method was most appropriate. Computer conferencing was used by students to produce written assignments and to deliver, by audiographic teleconferencing, material requiring visual presentation, such as maps, symbols, and battlefield graphics.

Method

Course Material. The course chosen for this teleconferencing demonstration was PHASE II, Command and General Staff Officers' Course (CGSC), Non-Resident. The course curriculum was delivered to students through lectures, discussions, and practical exercises. The course contained sixty-nine hours of instruction covering Soviet operations and tactics, U.S. operations and tactics, and U.S. logistics.

Test Sites. The hardware to support the package of distance learning technologies was installed at three locations:

Site 1. CGSC, located at Ft. Leavenworth, Kansas;
Site 2. Kentucky Military Academy, Ft. Knox, Kentucky;
Site 3. Ft. Dix High Technology Training Center, Ft. Dix, New Jersey.

Participants. Participants in this study were 145 Reserve Army Officers who were scheduled to attend Phase II of CGSC during the period July 24 through August 5, 1988. The control group, located at Dover, Delaware, contained eighty-three participants. The two experimental groups, located at Ft. Knox, Kentucky, and Ft. Dix, New Jersey, contained thirty-six and twenty-six participants respectively.

Design. This study followed a two-group single factor design. The two training methods compared were conventional classroom instruction and a technology package composed of interactive video, computer teleconferencing, and audio teleconferencing.

Procedure. All students who participated in this study received their instruction in a conventional classroom that could comfortably accommodate fifty students. Each class, with students seated in a row-on-row configuration, consisted of approximately thirty students.

Instruction was delivered to the control group by lecture, discussion, and practical exercises, which is the conventional method for the courses taught in RC schools. The primary method for delivering instruction to the distance learning students was also lecture, discussion, and practical exercises. However, instead of having an instructor present in the classroom, these students received the instruction via interactive video broadcast from Ft. Leavenworth, Kansas. Questions asked at one location were repeated by the instructor for the benefit of the other locations since students at the two remote locations could not communicate directly with each other. Forty-one hours of instruction time were delivered by interactive video. Of the forty-one interactive video instructional hours, twenty-one were devoted to lecture and discussion, and twenty to practical exercises.

The highly visual material, such as maps, battlefield graphics, and symbols, was delivered via audio-graphics. Eight hours of instruction were conducted using this medium to deliver three lessons: air-land battle overview, tactical air operations, and tactical operations. When using audio-graphics, the students were seated at computer terminals rather than in the row-on-row configuration. The student/terminal ratio was approximately five students to one terminal, and equipment for computer conferencing was available to the students throughout the instructional period. Instructors were present at the remote locations, where possible, to insure that instruction continued in the event of equipment failures.

Measurement Instruments

Pretest. The pretest was composed of multiple-choice items selected from the CGSC Comprehensive Skills Examinations. Initially, 180 items were pilot tested with 106 RC officers receiving training at the RC school at Reno, Nevada. The results were used to select the fifty items with the highest discrimination and difficulty indices. These items were used as the pretest for this study to assess the initial knowledge level of the groups.

Posttests. (1) Recognition learning: The usual end-of-phase multiple-choice tests were used as measures of learning outcome for this study. Three tests cover all Phase II content: 310A-Soviet operations and tactics, 318T-U.S. operations and tactics, and 318L-U.S. logistics. (2) Recall learning: A short-answer test was developed to measure the students' ability to provide uncued answers to questions concerning course content. This test was constructed in such a manner as to reflect the weighting of an educational objective according to its complexity and importance. For instance, if a particular learning objective has 20 percent of total course time directed towards it, then 20 percent of the recall test was dedicated to measuring that objective.

Participant Profile

Information was collected from the participants on a number of demographic variables that were thought to have an impact on learning outcomes. The following variables were examined: rank, age, branch, years of service, civilian education, and reason for course enrollment.

Since there was no opportunity to select participants randomly or assign students to comparison groups randomly, there was a concern the comparison groups would not be comparable on some or all of these variables. This would produce questionable results. However, analysis of the demographic variables indicated that the comparison groups were very similar in regard to these variables. Table 1 provides the reported percentages on the demographic variables for both distance learning and control groups.

Measures of Learning

Pretest. Participants were pretested to determine the level of knowledge they brought to the course. Since end-of-phase tests would be compared for teleconferencing and control groups, it was necessary to determine if the groups were starting instruction at approximately the same level of knowledge. An Analysis of Variance of the pretest scores was conducted and the results indicated statistically significant differences between the comparison groups in regards to initial knowledge levels. Group means and standard deviations are presented in Table 2.

Table 1. Demographic Variables

	Percentages	
	Distance Learning	*Control*
Rank		
Colonel	03	00
Lt. Colonel	03	05
Major	56	67
Captain	32	28
No Response	06	00
Age		
30-35	10	18
36-40	40	51
41-45	31	22
46-50	08	08
50+	01	01
No Response	10	00
Branch		
Combat Service Support	56	53
Combat Support	20	30
Combat Arms	24	17
Years of Service		
5-10	27	25
11-15	37	39
16-20	23	34
20+	03	02
No Response	10	00
Civilian Education		
No Degree	16	05
BA/BS	31	46
MA/MS	34	35
PhD/MD	16	14
No Response	03	00
Reason for Participation		
Professional Development	100	100

Posttests. Since the four measures of learning were significantly correlated, a Multivariate Analysis of Variance was chosen as the procedure for analysis in order to avoid the possibility of spurious results. This analysis indicated that the students receiving teleconferencing instruction achieved significantly higher scores (p < .001) than the control group on three of the four outcome measures. No significant difference was found between groups on the outcomes measure for Soviet operations. Means and standard deviation are presented in Table 2.

Discussion

It is important to keep in mind the limitations of this study when interpreting the learning outcome results. In a field study such as this, research control is often incomplete. There was no opportunity to select and randomly assign participants to conditions. Even though the groups were demographically comparable, the possibility exists that there was group inequality on some unexamined variable that could have influenced the results. However, on the basis of the data obtained in this study, the technology package demonstrated appears to be educationally effective. *When compared with students taught conventionally, students who received the distance learning instruction evinced superior knowledge of the subject matter at the end of instruction.* Due to the small sample available, however, it was not possible to obtain reliable data to assess the relative contribution of each of the distance learning technologies. Further research is needed to ascertain the relative learning benefits obtained by using each of the technologies used in this package.

Table 2. Measures of Learning*

	Distance Learning (n=62)		*Control* (n=83)	
	Mean	*St. Dev.*	*Mean*	*St. Dev.*
Pretests:	20.92	6.85	22.14	6.59
Posttests:				
Soviet Opns.	83.68	10.60	84.70	10.17
U.S. opns/tact.**	91.47	6.38	83.69	10.09
U.S. logistics**	91.76	5.99	84.35	9.06
Recall	29.06	9.45	23.09	9.03

* Computations are from raw scores and do not represent percentages.
** p<.001

While this demonstration provided a glimpse at using a combination of technologies to conduct distance learning, the connections between these findings to other curricula and training requirements can only be made with caution. Further studies should be conducted with a variety of curricula covering the spectrum of cognitive functions and course content.

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Empowering the Learner Through Computer-Mediated Communication

Lynn E. Davie and Rosalie Wells

Introduction

In distance education conducted through computer-mediated communication (CMC), students and instructors use personal computers and phone lines to communicate with a central host computer running a computer conferencing program. They can call the host computer twenty-four hours a day, read messages left by their colleagues, and leave messages for other learners. More than one person at a time can be connected with the host computer, but the usual experience is asynchronous; that is, the interactions occur one after the other. One participant may respond to a question posed by another several minutes or several days later. The choice of when to contribute to the discussion is at the sole discretion of the participants. In this paper, a CMC course will be referred to as the electronic classroom.

The literature on CMC in distance education is already fairly extensive, despite the comparatively recent introduction of this method into the field. (For examples, see Davie 1988; Feenberg 1987; Harasim 1990; Kaye 1989). Most of the literature is concerned with case studies, communication patterns, psycho-social dynamics, and requisite instructor skills.

Lack of contact between students and dependence upon an instructor can be among the limitations of the use of distance education for courses designed to develop student process skills or higher order cognitive skills. In these courses, lack of convenient contact with peers can make students more dependent upon instructors for providing both the structure and development of learning. This limitation can be overcome, however, by incorporating into the course activities which specifically require student initiative, student discussion, student reflection, or iterative attempts to improve one's work. These skills are particularly well suited to the electronic classroom and we include them in our concept of student empowerment. This article explores concrete ways a course designer can maximize the potential of CMC to enhance student empowerment.

Empowerment Defined

Empowerment is the expectation and enabling of a student to take a visible and meaningful role in the electronic classroom. Characteristics of empowerment are the courage to state an intellectual position, to support one's stand with well-constructed arguments, to be flexible enough to consider challenges to one's position, and to modify one's position as a result of dialogue with others. Specific features of the electronic classroom present the course designer with unique opportunities for supporting students as they discover and claim their personal power.

There are two elements which support the development of personal power. These are: (a) a sense of mastery, and (b) a sense of community. These elements come from a model of creative learning originally presented by Richard Jones (1968).

The first component of personal power, a sense of mastery, entails the acquisition of the skills for participation in the electronic classroom. These skills include analyzing large quantities of information, manipulating and communicating with text only, and operating computers and computer software to achieve the student's goals.

The second component of personal power, a sense of community, is the feeling of belonging to a supportive group of individuals working together to make meaning, to combat mutual isolation as distance learners, to provide support for and challenge to one another, and to learn to value the contributions of oneself and others.

The specific design features of an electronic classroom which can support empowerment include the redefinition of the instructor role, group interactions, the implications of text-based dialogue, and the presence of a permanent transcript.

Redefinition of the Instructor's Role

Successfully facilitating an electronic class will require various changes in an instructor's role (Kaye 1989). These changes may be reflected in such shifts as posing questions instead of supplying answers, deflecting a student's questions to the group, and learning when to remain silent so that others are encouraged to speak. The net result of these shifts is a reversal in the proportion of instructor-to-student talk. In a face-to-face class, the instructor may monopolize 60% to 80% of verbal interaction (Duncan and Biddle 1974), while a CMC instructor is less dominant (Quinn et al. 1983). In fact, some estimates suggest that a

CMC instructor may contribute as little as 10% to 15% of the class dialogue (Harasim 1987a). However, the CMC instructor is active in other ways, such as encouraging student participation either directly through positive reinforcement or more indirectly by designing assignments which provoke participation. This shift in the proportion of instructor-to-student talk in the classroom was associated with increases in student learning as long ago as 1966 (Flanders 1970).

One important consequence of the instructor's shift to more facilitative behavior is increased interaction, which necessarily involves more personal and personalized contact between instructor and students. Indeed, because of the geographical isolation of most distance students, a personalized relationship with the instructor can significantly affect completion rates (Coldeway, MacRury, and Spencer 1980). Ironically, the unique communication features of CMC can enable an instructor to provide even more personal attention to students than is possible in face-to-face classrooms, which are often characterized by large class sizes and competition for limited speaking time (Phillips, Santoro, and Kuehn 1988). An instructor at the Rochester Institute of Technology found personalized interaction was easier in an electronic classroom than face-to-face because conferencing software reproduces the student's name with comments, making it easier to form and maintain unique recollections of individual students (Bissell et al. 1987). Instructors who are aware of their students as unique individuals are in a stronger position to support their empowerment as creative autonomous learners.

Face-to-Face Meetings

There is considerable controversy concerning the necessity or advantage of including face-to-face meetings in a computer-mediated course. Generally, such a meeting is designed to facilitate both interpersonal interaction and the rapid acquisition of computer skills. Institutions which incorporate a face-to-face meeting prior to or during a CMC course include the Ontario Institute for Studies in Education (Harasim 1987b; Davie 1988), Nova University (Scigliano, Joslyn, and Levin 1989), the Dutch Open University (Meurs and Bouhuijs 1989), and the Western Behavioral Sciences Institute (Feenberg 1987).

However, no studies comparing matched CMC classes, one with and one without an initial face-to-face meeting, have been reported. Thus, there is no evidence to support the fairly common assumption that this meeting is essential to the success of the endeavor. In fact, various organizations have successfully offered CMC courses that consisted exclusively of online interaction. These include the Army Research Institute (ARI) (Hahn et al. 1990) and the British Open University.

While face-to-face meetings can facilitate computer training, they can also selectively penalize the most geographically distant students, negatively affect those students whose family or work responsibilities may prevent them from traveling, and increase the course costs for all students. A face-to-face meeting can encourage social bonding, but it can also negate the social equality advantages which CMC's lack of visual cues (that reveal age, gender, race, and so on) provides.

It is fundamentally important to encourage the psychological feeling of belonging to a group. This feeling may be fostered either through carefully designed activities completed at a distance or through a carefully designed face-to-face meeting.

Collaborative Learning in an Electronic Classroom

Students in an electronic classroom are also enabled by the medium to establish close personal relationships with each other, a feature that distinguishes CMC from other forms of instructional technology. While student-to-student or many-to-many contact may also occur in audio and video conferencing, such interaction may not be a pedagogical priority; in addition, frequency and range of student interactions are impeded by the necessity of synchronous dialogue. Audio and video conferencing situations provide a limited amount of "air time" which is often monopolized by the most assertive students.

In this respect, one of the greatest fallacies relating to face-to-face instruction is the idea that a many-to-many interaction between students occurs simply because many students are present and a few are talking. In contrast, the true many-to-many capability is one of the most frequently cited characteristics of a CMC classroom (Harasim 1989). Because of the democratic openness of the electronic classroom, all students have an equal opportunity to contribute on an individual and group level. Designing for group work and collaborative learning at a distance is a way to empower students through the establishment of a community of learners. Students become empowered as individuals by contributing to the group effort.

Empowerment through collaborative learning can occur in ways ranging from formal group work by design to more informal interactions chosen by the students themselves. For example, Karabenick (1987) has noted characteristics of CMC that encourage help-seeking behavior regarding both course content and hardware/software problems. Students are empowered when they discover that they can also function as teachers, whether it be in the realm of hardware/software problems or the course content as developed through small working groups. In other words, while hardware and software issues can be problems in a distance environment, they also can represent possibilities for empowerment of students who learn from other students.

The flexibility of CMC allows different learner populations to "attend" school. The inclusion of students who are unable to attend a face-to-face classroom by virtue of geographic distance, employment, or family responsibilities may produce diversity in the student population. A more dramatic case concerns international computer networks, which allow informal communication as well as structured educational projects between elementary and secondary students from countries such as United States, Israel, Japan, and Mexico (Cohen and Miyake 1986; Levin and Cohen 1985). Once acquainted through the medium of CMC, students may find ways to create new meaning through interactions that were not conceived by the designer.

CMC Empowerment through Synchronous Exercises: Examples and Contexts

Synchronous exercises can provide an instructor with unique opportunities for empowering students. A synchronous exercise enables immediacy of challenges and support, as well as reciprocity of experience. Reciprocity in time means mutuality of experience, whether by sharing a joke or by knowing that classmates are simultaneously engaged in the same activity at the same moment but in different places.

In some cases, the goal of a synchronous exercise may be to provide distance students with assignments comparable to those enjoyed by face-to-face students. Or a synchronous exercise (which is similar to face-to-face interactions already familiar to participants) can help socialize participants to an electronic classroom.

The Capstone exercise, the final assignment in the CMC Engineer course conducted by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is an example of a synchronous project (Hahn et al. 1990). In the face-to-face version of this course, students worked together for several weeks on a multi-part tactical problem, then briefed the results to a commanding officer. In the CMC course, both the group work and the briefing were done online. During this synchronous briefing, the student responsible for each uploaded the information to the officer, who read it and responded with online questions. Once a part was completed, the group was instructed to upload the next part. All the students in a group were instructed to remain online for the entire exercise, so that they could quickly respond to requests for more information, critiques, and so on.

Such exercises provide support for both psychological elements of empowerment. The students gain both a sense of mastery and a sense of community. These exercises can be powerful indeed.

The Pedagogical Use of Transcripts

Like face-to-face education, CMC offers a selective advantage to some students. In an electronic classroom, the text-based dialogue tends to give the advantage to those students who read and write well. Performance expectations for the students should be made clear at the beginning of the course. For example, in some parts of the electronic classroom, it may be appropriate to have informal expectations regarding spelling and formatting. After all, in the face-to-face classroom, we do not always speak in complete, well-formed sentences. Yet, some online contributions should be similar to written assignments, for which well-written and edited submissions are appropriate.

Text-based dialogue also helps free people from potentially stereotypical information about others. It is no coincidence that a considerable portion of the CMC literature is concerned with its implications for the physically handicapped. By denying participants often irrelevant visual and oral cues, CMC frees people for interactions based on competence. Making competence the predominant criterion for success challenges participants to become competent. By making irrelevant nonetheless influential features like physical appearance, rank, age, and so on, CMC allows people to experience comparatively rare moments when they can be judged solely on the basis of achievement.

In another respect, the text-based communication preserves a permanent record of achievement, safeguarding against forgetfulness and the sometimes self-serving modifications of memory. Thus, the permanent record challenges all participants to be accountable for their work, and to say precisely what they mean. By encouraging responsibility for one's words, the transcript encourages an awareness that words are extensions of one's self.

Because the electronic classroom generates a permanent record of the class discussion, any member of the class can return to earlier contributions, to rethink a position or pull together a thread of a conversation, linking an earlier thought to a current thought. While this linking can also take place in a face-to-face discussion, the press of time and the limited amount of "air time" may make it less likely that this self-reflection will occur.

CMC has some disadvantages, of course. The presence of the transcript can make tests or assignments based on recall less practical. Additionally, testing for lower order cognitive skills becomes more difficult. As a result, it becomes more important to structure the course assignments to require the higher order cognitive skills of structuring, insight, application, and evaluation, which subsume the lower order skills. Since so many ordinary face-to-face classrooms seem to concentrate on the lower order skills, this switch to the higher order skills may well require extensive development of the instructor's skills.

Transcript-Based Assignments

With the availability of a transcript, it is possible to design a number of instructional activities that promote student reflection. For example, students might be required to retrieve all the comments they authored during the course. The assignment could then ask the students to reflect on their contributions and provide a statement of the overall framework or perspective embodied in them.

A second possibility is to ask students to pull together all the comments related to a particular topic and to write an essay discussing which comments they agree or disagree with and why or to critique the comments from the perspective of a particular theory.

A third possibility is concerned with improving the student's analytic and writing skills. Too often, students write to please the teacher. This contribution is graded and then ignored by both parties. Instead of this dead end process, students can be asked to retrieve an earlier note or assignment and rewrite the work either to make it more effective, or to reflect the current state of learning. This kind of recursive learning can help the student build skills in a way that is simply not feasible in the face-to-face classroom.

These kinds of assignments allow students to look back and see their own growth and development. The transcript also can provide a sense of accomplishment as they review the accumulated comments of the semester. The transcript can encourage a sense of accountability by bringing students face-to-face with the things that they said, in contrast to a face-to-face classroom where comments can be forgotten or inaccurately remembered.

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Effectiveness and Costs of Distance Education Using Computer-Mediated Communication

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Introduction

Literature about the cost effectiveness of distance education tends to focus primarily on costs of specific media implementations (Rumble 1989; Solomin and Holden 1988); pragmatic discussions of models and costing issues (Markowitz 1987; Rumble 1986, 1987, 1988); and comparisons between traditional resident instruction and distance education (Hahn, Ashworth et al. 1991; Laidlaw and Layard 1974; Muta 1985; Rule, DeWulf, and Stowitschek 1988; Wagner 1977). In general, the literature suggests that distance education can be less expensive than resident instruction, depending upon student enrollment and the fixed costs of course development and delivery. The literature comparing the effectiveness of distance education to face-to-face resident instruction suggests that distance courses delivered with various media compare favorably with resident instruction (Beare 1989; Jevons 1982; Misanchuk 1982; Whittington 1987).

One medium that is comparatively new in distance education is computer-mediated communication (CMC), a means of communicating from different locations at different times (i.e., asynchronously) using a computer network. For training purposes, an electronic classroom is established by connecting all students with each other and the instructional staff. A student or instructor can participate in the classroom from any location using existing telephone lines and a computer equipped with a modem. Computer conferencing allows students to work together in groups, to ask questions of their peers and the instructor, to tutor classmates, and to informally share experiences. Computer conferencing also allows the instructor to facilitate small group instruction, to administer tests, to provide prompt feedback on student performance, or to give remedial instruction.

The literature on cost and effectiveness of distance education specifically using CMC is sparse, despite the fairly rapid growth in publications (cf. Davie 1988; Harasim 1990; Hiltz and Turoff 1978; Mason and Kaye 1989; McCreary and Van Duren 1987). Information on the costs of implementing a CMC classroom is limited to Rumble's (1989) detailed explication of the Open University's experience with the course "Introduction to Information Technology: Social and Technological Issues" (DT200). The explication describes two types of course costs: the cost of introducing a CMC component into DT200, in which students already had access to stand-alone microcomputers (an already existing computer infrastructure served as a framework for the additional conferencing costs); and the costs of the computer infrastructure itself (primarily equipment costs).

While cost data on CMC implementations are extremely limited, empirical studies on the effectiveness of CMC compared to resident instruction are equally rare. Most of the CMC literature consists of descriptive case studies and prescriptive overviews. Available data usually consist of the number of public and private messages exchanged between students and the instructor, rather than empirical studies on the comparative effectiveness of CMC.

The purpose of this paper is to summarize an investigation exploring both the cost and effectiveness of using CMC as a means for meeting the educational requirements of the U.S. Army's Reserve Component. To evaluate student performance for CMC and resident education, investigators studied two different courses: engineering and leadership.

The procedures used in the two courses were essentially the same. Therefore, the engineering course will be described in detail, followed by a brief description of the leadership course.

The Engineering Course Procedure

Computer Training for Students. Students were mailed all their computer equipment, with written assembly and operation instructions, and course materials. Computer training was accomplished through self-conducted lessons designed to familiarize the students with the operation of the computer and software. Technical assistance for hardware/software problems was provided by means of a toll-free "hot line" telephone number. There was no face-to-face meeting for the CMC students.

CMC Instructor Training. Part-time instructors were provided the same equipment and software as the students. In addition they were given a forty-hour training course on operating the hardware/software and on the responsibilities of a distance instructor, including teaching/motivational techniques suitable for an electronic classroom (see Harbour et al. 1991; Hahn, Harbour, et al. 1991 for these training documents). Instructional staff and researchers met together to conduct this training using a combination of lecture and hands-on practice with the computer.

Participants

CMC Group. Fourteen U.S. Army Reserve Component officers studied a section of a career advancement course for U.S. Army Engineer officers delivered at a distance using CMC.

Residence Group. For comparison purposes, performance data were collected from Reserve Component students taking the same course in residence at the U.S. Army Engineer School from October 1986 to June 1989. Data were collected on final exam scores (n=370); pre- and post-surveys were administered to a subset of the resident students (n=49) to assess perceptions of the amount learned during the course.

CMC Instructional Staff. The instructors included a civilian full-time course manager/administrator responsible for the overall operation of the course and three part-time instructors. The part-time instructors' responsibilities included directing group discussions, providing remedial instruction, and/or monitoring student progress.

Course Content, Media, and Conversion

Course Content. The program of instruction was identical for the CMC and resident classes; it consisted of a two-week block of instruction from the Engineer Officer Advanced course. Course topics included technical engineering skills (Airfield Damage Repair, Military Petroleum Pipelines, Asphalt Production, Flexible Pavements, Roads and Airfields, Military Bridges, Rear Operations) as well as Army tactics, leadership, and briefing and presentation skills.

The resident course was offered in a traditional military classroom setting, with students living in residence and attending classes eight hours a day, five days a week. In addition to the forty hours a week of classroom instruction, students were expected to study during the weekend and evenings. They were paid for their time and expenses. Typical media included: lectures, computer-aided instruction, and small group instruction with practical exercises. Instructor evaluation consisted of a final exam at the end of the two weeks and a graded practical exercise.

CMC Course Conversion. Material written for resident instruction was modified for distance delivery by CMC. The course was analyzed to determine the appropriate match of distance media to course content. Media options were limited by equipment availability in the home. Since computers were provided as part of the study and it was assumed students could get access to videocassette players, the methods and media used were: computer-aided instruction, storyboards, computer conferencing, computerized testing, paper-based readings, and video tapes. For resident students, this block of training was delivered in two weeks of full-time classroom instruction, plus study sessions during evenings and weekends. However, this block of training required seven months to deliver to the CMC class, due to the part-time status of the CMC students as well as the asynchronicity of CMC. As a result, in the CMC class, cumulative tests normally delivered at the end of the two week resident training were replaced by frequent quizzes and shorter exams. In addition, due to the longer duration of the CMC course, course material was redesigned into smaller units with frequent testing and instructor feedback. The practical exercises were conducted using both synchronous and asynchronous computer conferencing. More information on specific categories of conversion is presented in the section on data analysis.

Equipment and Software for Communications. Each student was provided with an IBM XT computer with a twenty megabyte hard disk, color monitor, and printer. Software and courseware loaded on each computer consisted of: 1) a specially developed course management system and communications package; 2) computer-assisted instruction and tests; 3) a word processing package; and 4) a spreadsheet. The conferencing software was Confer II, with a specially designed interface for the Engineer course.

This interface software was designed according to a schoolhouse metaphor that related features of the CMC classroom to more familiar features of face-to-face instruction. For example the student could select from a menu screen the following options: the office (a place for administrative matters like announcements and class standings); the mail room, instructor help room, and team leader help room (places for private communication); the break room, team room, and classroom (places for group communication); and the writing center (a place to do homework and other written assignments).

The Leadership Course

Thirty-one U.S. Army Reserve Component non-commissioned officers studied a career advancement course on Army leadership using CMC. The comparison control group was a group of thirty-two Reserve Component non-commissioned officers taking the same course in residence. Instructional staff consisted of six part-time Reserve Component non-commissioned officers and one full-time course manager/administrator.

The course content was identical for the CMC and resident classes. Course topics included leadership skills, promotion system, training management, property accountability, and map reading. The resident course media included paper-based materials, lectures, discussion, and practical exercises; the CMC media included computer-aided instruction, video tapes, paper-based materials, and discussion.

Each student was provided with a Zenith Laptop computer and printer at home. All other software was the same as for the Engineer course.

Data Analysis

Performance. Dependent variables for the Engineer course included: 1) pre- and post-course student perceptions of their knowledge of the course topics; 2) test scores; and 3) course completion. Dependent variables for the Leadership course were: 1) test scores and 2) course completion. Analysis of variance procedures for a two-group design were used to compare the resident to the CMC course for both engineering and leadership.

Cost. The cost in time and dollars to develop/convert course materials and run one iteration of material normally covered in two weeks of Engineer resident training was computed for the CMC class. These estimates were based on two assumptions: existing software and communications packages will be used and the guidelines for course development/conversion and instructor training will be used (see Harbour et al. 1991 and Hahn, Harbour, et al. 1991).

The method used to derive the costs for developing and converting CMC and resident training was based on guidelines developed by the Army's Training and Doctrine Command (TRADOC). The estimated time values were derivations of the actual amount of time spent by the CMC project staff to develop/convert the block of the course tested in the present research.

The costs to convert the resident to the CMC course were estimated for training program development, instructional design, instructional development, computer-based instruction, and video production. The costs to execute the course included production, equipment, training, shipping, and operations and support. Execution costs, i.e., start-up costs plus the recurring costs, were computed separately for each course iteration. It was assumed that start-up costs would be repeated every five iterations.

Costs of operating the resident course were obtained from TRADOC. There are no costs for converting resident course materials since it was assumed that the course has already been developed for resident instruction.

Results

Performance. A comparison of the students' self-ratings of their level of knowledge before and after the engineering course showed that the CMC group had significantly greater gains (33% vs 12%) in the perceived amount of learning (F=5.73, df[1,42] p<.05). However, there was no reliable difference between the test scores of students in residence versus CMC (F=1.80, df[1,377] p>.05). Course completion data showed that 95% of the resident students compared to 64% of the CMC students finished the course. The most frequently cited reasons for noncompletion included conflicts due to family and job commitments and delays due to changes in the experimental course schedule.

Data for the leadership course showed that the CMC group had significantly higher test scores (84% vs 75%) than did the resident group (F=13.6, df[1,56] p<.001). Completion rates were 90% for the CMC and 96% for the resident groups.

Cost (Engineer Course Conversion). As previously mentioned, there are no conversion costs for resident instruction. Indeed, course conversion is relevant only for a CMC class, because it entails the redesign or restructuring of existing course content for delivery via media that may be accessed through a CMC class. The total estimated time value for converting the existing two-week block of resident training to CMC is 4,249 hours as detailed in Table 1. This translates to $152,300.

Table 1. Staff Hours for CMC Conversion

Category	Staff Hours	% of Effort
Course Requirements Analysis	435	10
Course Design	163	4
Course Development	2588	61
CBI/Slide Conversion	812	19
Video Tape Production	251	6
Totals	4,249	100

Projected Execution Costs. The cost data collected for the two-week Engineer course were used to make projections for executing the same course for a fifty-student class for five iterations. In Table 2 are listed both the start-up and recurring costs. Start-up costs of equipment purchase and instructor training were estimated to be $73,100. Costs that will recur with each iteration were estimated at $121,000. As shown in the bottom of Table 2, the cost per student is $2,716 (computed by adding together the start-up costs divided by 250 students and the recurring costs divided by fifty students). Comparable resident training costs $5,793 per student.

Table 2. Projected CMC Execution Costs ($K) Over 5 Iterations

Category	Start-Up	Recurring
Production	—	17
Equipment	49	—
Training	24	.3
Shipping	—	8
Operation and Support	—	96
Totals	73	121.3
Cost/student = $2,716		

The costs of executing the resident course are plotted over ten iterations in Figure 1. The total combined course conversion, start-up, plus the recurring costs over ten course iterations, are also plotted. Initially resident and CMC are similar ($288,200 vs $289,600). However, when the costs of conversion and execution are amortized, CMC costs 43% less after five iterations. After ten iterations, CMC would save 48%.

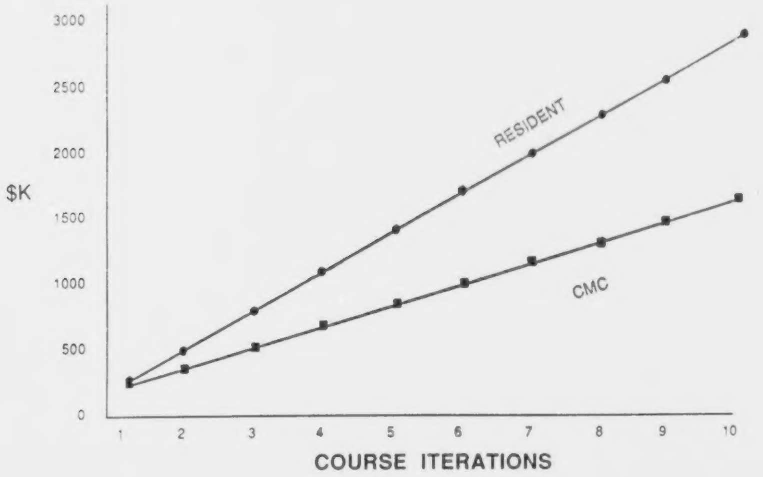

Figure 1. **Total course conversion, start-up, and recurring costs for fifty students. After ten iterations CMC costs are 48% less than resident.**

Discussion

The use of computer-mediated communication to create an electronic classroom for distance study was shown to be a cost-effective alternative to resident training. Students taking the distance study CMC course achieved test scores no different or better than those of their resident counterparts, providing empirical evidence that the effectiveness of distance education using CMC is comparable to face-to-face instruction. This finding is important because resident instruction is considered by many to be the "industry standard" for good quality education. Furthermore, not only is CMC at least equally effective, but it also costs less than resident instruction.

By making group work and other benefits of classroom instruction accessible to the distance student, CMC can be characterized as adding value to traditional correspondence education (Thomas 1989). In addition to providing distance students with pedagogical experiences typical of face-to-face instruction, CMC may make it possible for institutions to expand both the range of courses and number of majors that are available at a distance. For example, the availability of computer simulations may increase the range of courses that can be converted for distance study. In some cases, the need for face-to-face meetings in a distance course may thus be reduced or eliminated entirely.

This study also considers the costs of course conversion and the economics of student drop-out, two topics that rarely emerge in the distance education literature. Course conversion is rarely addressed (Rumble 1986 is an exception) because many distance teaching institutions use materials they have developed for that express purpose. However, converting prepackaged material and media becomes an issue when an institution seeks 1) to offer distance students an educational experience comparable to what is available in traditional residence instruction; and 2) to design an electronic classroom rather than merely using CMC as a communications adjunct to its correspondence classes.

The conversion and execution costs reported in this study are useful in that they suggest categories of expenditures as well as ratios between them that might be relevant to program planning and management. For example, the single largest component of course conversion is course development, as shown in Table 1. Course development includes the formulation of a course management plan, the development of student aids as well as a training manual for distance instructors, the validation and revision of lessons, the construction of tests, and assembly of the final product.

The fact that course development is the most expensive part of conversion suggests that transforming a distance course into a CMC classroom can entail major alterations in both material and media. Because of their existing supply of packaged course materials, distance teaching universities already have a cost advantage over conventional face-to-face institutions in terms of converting a course for CMC. However, if group projects and classroom discussion are pedagogical priorities, CMC cannot simply be tacked on to existing materials as a communication adjunct. Because CMC enables group work and class discussion at a distance, course materials designed for independent study must be redesigned for the group environment. In short, if CMC is not an integral part of a course, it will be under-utilized, if it is used at all (Hahn, Ashworth, et al. 1991; Mason 1989). It is also important to note that the cost of supplying students with equipment was actually minor, compared to costs of course development or operations and support. This finding is noteworthy, since institutions interested in CMC implementations may over-estimate computer costs and under-estimate the costs of conversion. Further, the costs of computer networks can be expected to decline, as the number of users increases. Thus, this component of operations and support can be expected to decrease in the future.

While the data in this study are consistent with that in the literature that suggests distance education can be a cost-effective alternative to resident instruction, it is important to note that both the costs and effectiveness of CMC will vary with the type of implementation. One cost consideration is the number of students in the class. For example, the costs of the Open University's DT200 were amortized over 1,364 students, while the cost figures for the Reserve Component implementation are based upon fifty students. For some topic areas, it might be impossible to achieve an economy of scale characteristic of many courses at an institution like the Open University. In this event, the "value added" potential of CMC might still justify its use.

Student completion rates can also affect the costing of a CMC course because lower completion rates result in more costly graduates. Thus, one way to lower costs is to decrease the drop-out rate. Effectiveness may also decrease with high drop-out. For example, one advantage of CMC is the ability to do group work at a distance; the ability of a group to complete assignments and benefit from each other, as in a face-to-face classroom situation, is severely hampered with high drop-out. Additional research is needed to discover ways to improve the completion rate for CMC distance study. A means of predicting which students are likely to succeed or drop-out of distance study will help educators and trainers maximize training resources, both by selecting appropriate students and by providing assistance for those at high risk.

In addition to completion rates, another issue affecting cost evaluation is the way CMC is utilized. It is impossible to estimate how much a CMC class will cost without defining its pedagogical purpose. For example, CMC used only as an electronic hot line will be considerably less expensive than a fully developed electronic classroom with group projects, an electronic lounge for informal dialogue, a computerized course management system, and traditional correspondence materials that have been converted for the purpose. However, both categories of expenditures and ratios could easily change if CMC were used in an alternative manner. It must also be kept in mind that CMC classes may be unable to equal the performance of resident classes which rely on group work if CMC applications fail to incorporate interaction among students.

Conclusions

Based on two different courses, it appears that the CMC classroom can, in fact, be a cost-effective method of distance study. However, both the costs and the effectiveness may vary as a function of class size, student drop-out, and the type of implementation. The model of implementation used in this research involved a great deal of instructor-student communication and accountability which, we believe, are major factors in reducing drop-out rates. Since other models were not directly tested, caution should be exercised in extrapolating these findings to other uses of CMC. Amortized course costs were shown to be less than typical resident costs. The largest category of cost was the redesign and development of course materials specifically tailored for group CMC and home study. Even so, it is strongly recommended that courses originally designed for independent study be converted to allow group and instructor interactions. Then it is likely they will achieve effectiveness at least equivalent to traditional courses.

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NOTE: This paper is not to be construed as an official Department of the Army document in its present form.

INTERVIEWS

Speaking Personally —with Colonel William A. Wojciechowski

The Extension Course Institute (ECI) is the Air Force's center for distance education. In this interview, Colonel William A. Wojciechowski, Commandant of ECI, discusses the Institute and the overall Air Force correspondence education program with Lt. Phil Savarise. This discussion took place in July 1987 at ECI, located on Gunter Air Force Station in Montgomery, Alabama. Colonel Wojciechowski came to ECI in August 1986.

P.S. How would you describe the Extension Course Institute to an individual who is totally unfamiliar with military education programs?

W.W. ECI is a school that offers a cost-effective alternative to resident instruction. It is a technical school, a management school, and a professional school that incorporates the best of resident curriculum, packages it in a very compact mode of delivery, and allows for instruction to officers and enlisted military personnel and civilians worldwide.

P.S. When did the Air Force recognize the need for a distance education program?

W.W. The need became very apparent in the early fifties when the Air National Guard and Air Force Reserve were being integrated into the "total force" concept. Under this new concept, both the Guard and Reserve would take on some of the same missions as the active Air Force, supplementing and complementing active Air Force performance of those missions. This would allow the Air Force to have a broader capability without maintaining such a large active force. As the Guard and Reserve began to take on more of the active mission, that meant they would need more training. These people did not have the opportunity to get away from their civilian jobs for long periods of time, so the Air Force found that by using correspondence course instruction they could deliver the necessary technical and professional military training to a wider audience in a nonresident mode. The Air Force found this to be a highly acceptable alternative for training their Guard and Reserve members. ECI also made available technical and professional education to the active force as well. So this was the beginning of distance education in the Air Force. Later on, in the sixties, the Air Force went to a dual-channel, on-the-job training program whereby correspondence education materials were used in conjunction with the hands-on training in the field to upgrade individuals from apprentice to journeyman to master technician. This has been the mainstay of our technical and proficiency training over the last twenty-five years.

P.S. Let's talk a little more about the Air Force dual-channel training program. What exactly are ECI's responsibilities in support of this program?

W.W. Dual-channel training is a program which incorporates both academic and application training. ECI provides material for principles and theory, which are the academic portion of the material being taught, and the job setting provides the application portion of that training. We call the two combined the dual-channel on-the-job training program, dual-channel meaning academic and hands-on instruction.

P.S. How are the courses that are used in this dual-channel training program developed?

W.W. The Air Force has several Technical Training Centers located across the United States. Each of these centers is responsible for providing technical training to enlisted Air Force personnel to qualify them as semiskilled in a particular career field; in other words they are the Air Force's resident schools. The course materials used in the dual-channel training program, which we call Career Development Courses, are developed in the Technical Training Centers by technicians who have extensive experience in the field as well as the instructional background to develop the curriculum. This way, we are assured that the materials are complementary and are not repetitive of those which are taught in resident courses and that they reflect what is going on in the field. Furthermore, the Air Force employs what we call an Instructional Systems Development process for the development of their course materials. That is, instruction is based on a needs assessment and a task analysis of what the technicians in particular fields are accomplishing on their jobs.

P.S. What is ECI's involvement in the development of these Career Development Courses?

W.W. You must remember that the course writers are technicians first and course writers second. As a group they are most likely to find their difficulties in writing conversational English, and in writing the text material in a way that best communicates. ECI provides a service whereby the draft course materials are put into an academically acceptable form. ECI not only pays attention to the content of the course, in terms of style, clarity, and the use of plain, understandable English, but also ensures that the course materials are properly sequenced, that the course content supports course objectives, and that the evaluation instruments in fact measure the learning objectives the courses are designed to produce.

P.S. Are there any ways in which ECI is involved in the front end of course development?

W.W. Yes. ECI has a resident course, the "ECI Course for Authors," which provides approximately sixty hours of training to the course writers in the outlining, developing, and sequencing of the course materials. The course deals with tips on how to write materials and how to support the learning objectives and, of course, how to handle all the administrative details that make a package ready for processing here at ECI.

P.S. What happens to a course once ECI receives it from the writer in the field?

W.W. First, when a course arrives at ECI, we begin to control the process to ensure that all aspects of the course will be well prepared before reaching the students. The course materials are screened to ensure that the manuscripts contain all the materials needed for the student to complete the course. They go to our Text Review Branch, where education specialists review the materials to see if they are in an academically acceptable form, as I mentioned earlier. Then they put the text in a plain English style to make it easier for the student to study and to comprehend the material being taught. From there, the course materials are sent to course editors, who work on style, punctuation, and grammar and who ensure that regulations are properly cited and that illustrations feature current information. Then the materials go to the Test Development Branch. There test developers do certain checks and analyses; test questions are reviewed and rewritten as necessary to assure that the test questions directly support learning objectives. After we've completed our preparations, we send the materials to be printed. When we get the final products back from the printer, we store them in our warehouse until we send them to our students.

P.S. Once the course is sent to the student, will ECI have any further involvement with the course itself?

W.W. As you know, course evaluation is extremely important to any effective education program. At ECI, we have both an internal and an external evaluation program. Internally, we look at all our course materials and analyze feedback from the field that we receive from our student inquiry system. Our accreditation by the National Home Study Council is an added evaluation measure to assure that we are supplying our students with quality course materials. Externally, we deal with feedback we get through a student survey sent with every course package, and we'll soon receive additional feedback through a survey we have just developed to poll students' on-the-job supervisors. Also, we analyze all of the students' end-of-course exam results to determine how well students are achieving the learning objectives and to determine if any test questions need to be deleted. These are just some of the tools that we use at ECI in constantly evaluating our program — and we evaluate not only the educational quality but also the quality of our services.

P.S. Who is the ECI student?

W.W. The ECI students are, again, the total Air Force — not only active duty personnel, but also officers and enlisted members of the Guard and Reserve. The ECI student is the civilian employee of the Air Force and other Department of Defense agencies. The ECI student may also come from one of the other branches of the service or even from a foreign military or civilian organization. Training is available on a required basis, such as the Career Development Courses, or as an optional training program as it is in our Professional Military Education and Specialized Courses. About 52 percent of our student body is from the active Air Force, 42 percent from the Guard and Reserve, and the remaining six percent from all other categories of students.

P.S. Considering the large number of students that you work with, how do you ensure that each student receives the attention that he or she needs?

W.W. Well, contact with the student begins with that student-supervisor relationship that is so vital to the student's on-the-job training. The student can bring any problem he or she is having with the course to the attention of his or her supervisor. ECI is involved with the student throughout the learning process, from enrollment to course completion. Students have the option to gather additional information if they feel it is necessary. They can write to the course author — information to that effect is featured in each text — or they can call or write to ECI concerning questions dealing with text material, test questions, or any other administrative problem associated with going to school, so to speak. Our staff in the Student Instruction Branch ensures that each inquiry is answered in a short period of time. Most of these inquiries come to us directly by telephone through base Education Services Offices and are answered on the spot. So, as you can see, ECI is continually involved with our students as well as our courses.

P.S. Has the Air Force correspondence education program been effective?

W.W. It has been very effective. It has been effective in an educational sense because the Air Force has a good upgrade program, upgrading enlisted personnel from one skill level to another. The fact that these students are not having difficulty with the specialty knowledge (job knowledge) test used for promotion attests to the fact that the end-of-course exams are on the mark and are accomplishing the goals set for them. This is cost-effective training. We have been able to train large numbers of students — I'm talking in terms of 400,000 in a year's time — at a fraction of the cost it would be for these people to attend resident education. It would be impossible for the Air Force to have such a far-flung training program and professional military education program without the services of an organization such as ECI.

P.S. I know that ECI is currently involved in a major automation project. Can you tell me what this project involves and how it will affect the quality of your programs?

W.W. First, the automation project is an electronic publishing project, which will allow the subject matter experts, our course writers, to be tied in directly to the text reviewers and test developers at ECI. We will be able to develop and process materials almost simultaneously. The fact that both the course writer and ECI staff can be working together, rather than separately, will allow us to speed up the development process while actually increasing the quality of our product since it will increase communication between the ECI staff and the subject matter experts. With this new system, students will receive up-to-date course materials in considerably less time because we will have greatly reduced course development time.

P.S. Is this more effective than having the course writers working here at ECI?

W.W. Yes, simply because of the vast number of supplementary training resources at the Technical Training Centers. These include various training aids, models of the equipment being developed that the students will be working on, and other instructors who serve as resources for the subject matter experts. This electronic publishing allows us to tap into rich resources we have at the Technical Training Centers and still use our Instructional System Development experts here at ECI. So we have the best of both worlds — that is, we have the best in terms of form and process and the best in terms of subject matter.

P.S. What changes do you foresee in the Air Force distance education program in the next ten years?

W.W. We are going to be dealing with a paper product for the foreseeable future. However, I see a time when we can fully automate the enrollment process, the evaluation process, and the student records process, as well as all the administrative aspects, which I think will increase student services. I see a time when ECI will be developing course materials on computer disks and using them as a medium for instruction. As the Air Force obtains more and more computers for administrative purposes, there is no reason why these computers cannot be made available after normal duty hours for students to use in computer-assisted instruction, should we put our courses on disks. Looking much further out to the future, yet perhaps as close as twenty-five years, I can foresee a time when all course materials will be on-line and all students will go to a center or access ECI courses through a modem and take part in interactive computer-assisted instruction. Students will be able to "dial up" their exams once they have completed the course and feel they are ready to test. With automation, there are a great many possibilities to ensure rapid and frequent instruction almost any place in the world where there is a telephone and a computer.

P.S. Where does ECI stand in the overall Air Force training program in the next few years?

W.W. The role of ECI will continue to grow. With the need for increased technologies and the development of new weapons systems, the need for technical training will grow. However, the irony of this situation is that the development of these new weapons systems costs a great deal, and the development of the associated training also costs a great deal. We pour a lot of money into hardware, and we use the money that is available for training; so it stands to reason that resident training will be reduced. Distance education is a viable, highly effective alternative, in terms of cost and in terms of reaching large numbers of students. We have proved that we can do the job and that we can deliver instruction. I can see where ECI will be put in the position to develop more instruction and more complex instruction. I know that ECI has both the personnel and the desire to meet Air Force training challenges in the future.

Phil Savarise

INTERVIEWS

Speaking personally — with Kathryn Porter and William A. Mason

In this, the first American Journal of Distance Education interview that focuses on the corporate sector, editorial assistant Dawn Middleton-Paradise talks with Kathryn Porter and William A. Mason.

Ms. Porter is a Manager at the Hartford, Connecticut-based Aetna Institute for Corporate Education. Mr. Mason is an Audio and Visual Media Consultant for the Institute.

Aetna Life & Casualty is a leading United States based financial services organization marketing a variety of insurance, pension, and financial products for individuals, businesses, and other institutions in the United States and selected international markets. Based on assets of $72.8 billion, Aetna ranks as the largest investor-owned insurance and financial services organization and is among the fifteen largest U.S. corporations.

In addition, Aetna is the largest investor-owned insurance company underwriter and administrator of group insurance benefits and the largest stock-insurer of casualty-property coverage. Aetna is also one of the largest investors and a major source of capital funds of U.S. businesses. New investments made by the Company in 1987 amounted to $23 billion.

In 1987, Aetna won a gold award from the International Teleconference Association for educational programming.

DMP: It is my understanding, Kathryn, that you are part of Aetna's corporate training organization and manage a unit called Access. Please share with us what Access is and your management role.

KP: Access was created as an organization to encourage and increase access of training and education to home office employees and field office employees largely by technology. The unit is composed of self-paced education centers that service home office employees and mail materials to 235 field offices. Bill Mason is responsible for all audio-visual or video and audio image training and education programs. He designs for the satellite as well as for linear video programs or audio-cassette programs. We also have a computer-based education unit that designs training delivered via computer be it mainframe, interactive video, or PC. Finally, Access has an evaluation unit that incorporates assessment activities within a training program. We want to determine whether the student is learning and if so, what they are learning and how that impacts the company's mission. In summary, Access not only supports the Aetna Institute corporate program, the management training program, the data processing and systems program, but also serves as a vendor to any of the divisional training programs. Our divisions do most of the product and process training in the company and often need a technology-delivered product for training their field force.

DMP: Thanks Kathryn. Bill, would you comment about educational technology within the corporate arena and more about your role?

WM: Technology is here to advance the goals of the Aetna Institute and our profit centers in terms of meeting our business goals and the training needs of our employees. Some might suggest that because Access is an educational technology unit that we are only selling technology solutions; we are not. What guides us is the identification of the right delivery mechanism for the audience and for the content. If it needs to be delivered at a distance, is it better in a classroom in the field or using computer, satellite, audio, or print delivery systems? I function as a team member with instructors and subject matter experts from our divisions. We work together to answer the questions of how effectively we can train, provide a product that teaches, in the time required and at the right cost. Keep in mind that educational technology is one part of the answer.

KP: If I may add to your remarks, Bill, our main concern is to increase access to education in the most expeditious way. We happen to focus on technology but if technology is not the way to do it, we do not recommend it. The key is to make sure that the design is effective and efficient in terms of time away from the job.

WM: The wide range of issues that tend to be condensed in a classroom of fifteen to twenty-five people explode in distance learning because the audience size grows so. Those issues include the wide range of feedback approaches, learning styles, age ranges, and what happens in the distancing, and what happens in the teacher support that is central for a student. Those are the kinds of considerations I bring from the educational arena to corporate training.

DMP: Kathryn, would you give us a historical snapshot of Aetna's use of technology for training and distance delivery?

KP: Some fifteen years ago Aetna became involved in delivering computer based education and training for new data processing systems. The development of an educational program delivered via a mainframe became part of the systems design strategy that the company used. We created many programs to support all of the automation activities in the seventies that have made Aetna known for its excellent systems. It provided training to the field rather than bringing people into the home offices. With the evolution of personal computers and other computer-delivered technology we have continued to use computer-based training in navigational and transaction processing programs designed so the student understands what it feels like to work with the system without working on the real system.

Additionally, we began experimenting with a satellite in the early eighties. It was a two-way teleconferencing system that had video and audio images going both directions. That system became too expensive to maintain and we have reduced our capability and limited it to meetings in the home office area. In its place we have developed a one-way video satellite-based system. We conducted an experiment about six years ago. It was successful in that people understood the power of the system, but at that point the company chose not to invest in the whole system because of expense. In 1986, the system was approved and we began wiring twelve pilot offices. We chose "Business Writing Workshop" as our first course. Since then, the hours of use for training programs as well as marketing programs have continuously grown. Although the field offices have different configurations, they now all have the capability of receiving the video signal, and using the telephone for interaction. They also tape for replay later.

DMP: Bill, please explain the needs assessment process, and how "Business Writing Workshop" was developed.

WM: Kathryn and other management teams set up an audio conference with field offices to ascertain the training needs of the field offices. Three content areas were identified. Of the three, business writing had the highest demand or concern. So the challenge became to take the existing classroom course, and determine the re-design considerations. We looked at the kinds of employees who take it, their reactions/questions during the program, as well as the kinds of content that are essential. We certainly found out that there is a difference between designing for the medium and re-designing something from the classroom. The course was torn apart and rebuilt. The design team was essentially myself and an instructor, the instructor's supervisor who was the curriculum head, an evaluator, and Kathryn as the unit head. We were joined by Pam Cook from corporate communications who acted as the director and script writer. The evaluator was critical because she kept us on course to meet the course objectives. The team became the formative evaluators because there was no time to pilot it before a typical audience. This program has been offered seven times to date. In fairness to ourselves, we have redesigned it six times. Each time we learned from the evaluation and made significant modifications. We have also added another instructor into the mix. However, in all cases the principles that guide us are what we know about how adults learn in terms of distance learning. Good teaching provides the learner with the basic concepts, provides additional application to take it out of the abstract, provides experience so adults can take the abstract and place it into a practical arena, and finally provides feedback and evaluation. The audio/telephone return part is essential to support the students. The design allows our students to work with other students in their locations, call in for referencing, for questioning, or for a dialogue with the instructor.

DMP: Kathryn please describe more on learner support and explain the other courses offered by distance delivery.

KP: We are very cognizant that there are new media for our instructors. We also realize how new it is for the student and how we have to work at preparing the students. We start by helping them achieve some comfort level, helping them understand how the course is designed and what the interactions are going to be. We also run an audio conference about a week before the program with the facilitators who have been identified at each of the sites. We explain to them how the program is designed and provide encouragement to make sure that the group interaction that is designed into the program really happens. We ensure that they are comfortable using the telephone and establish that the facilitator is truly the extension of the Institute but on site.

Let's talk a bit about feedback because that is so important. At the end of the first module, there is a homework assignment. Participants are asked to evaluate and review a poorly written memo and edit it. They are also asked to start applying these editing activities to the memos they write on the job. At the beginning of the second module (one week later), the homework is reviewed on air. At the end of the second module, they are asked to select a recently written memo and send it to us. We have a team of people who evaluate each one. Within a month's time we have reviewed all materials and returned the memos to the individual who can see his/her progress. This is a large undertaking as classes range from 1,500-1,600 participants. Feedback includes suggestions for additional kinds of training or practice as well as identifying the strengths and weaknesses. We have analyzed the feedback and can say that 90 percent of the students have made some change in their writing habits. However, we won't say they have become perfect writers. We know that to become proficient writers, practice is necessary. We provide some of the concepts and now it is up to the individual and his/her supervisor (who will be giving on-going feedback) to see growth and change. One program I would like to see developed is that of supporting supervisors and helping them learn to be better editors and to provide better feedback.

We have two additional courses that run two or three times a year. One is a first line manager's orientation program, which is aimed at getting supervisory information to new first line managers within the first six months of their supervision appointment. That program gets them to begin to look at how to create a development plan and how to affect people. It also provides them with a model of planning, controlling, directing, and monitoring. The other program is called "Back on Track," and it's a program to help people who have employees whose performance is inconsistent or not meeting standards. It gives them a model to use. The evaluation for "Back on Track" is truly follow-up. We ask them to report back to us on the success of applying the model. This occurs about two months after the end of the program. We have just received those comments back and around 60 percent have actually applied the model and confidently feel like they are being successful in turning the employee around. Those that do not feel successful provide a variety of reasons: they have changed jobs, they don't have the courage, or they are working on it but haven't succeeded in turning the person around yet.

DMP: Is "Back on Track" designed similar to "Business Writing Workshop?"

KP: It has the same kind of design. It includes a combination of information, exercises to be completed individually and in a group, feedback, and discussions via the telephone. It also includes video cases. In one video case students study three different supervisors and identify their strengths and weaknesses and where their development opportunities are.

DMP: Kathryn, as a follow-up, is your staff presently developing new courses? Will there be any delivery changes?

KP: Aetna is embarking upon a major shift in terms of developing managers. We have identified ten management competencies. In 1990, we plan to deliver management training on these competencies to all people who supervise at any level in the corporation. We have some 6,500 managers who are first line managers. All of those people will go through some form or level of training. This training design is a combination of self-paced instruction, DBS (satellite) delivered, audio conferences and classroom training. DBS will be used for our home office audience as well as our field office audience. There will be some twenty-one plus modules of training being delivered in 1990 using satellite. It's a little bit like going 0-60 in five seconds.

I also should say that although we've talked a lot about the Institute's particular programs, the company also uses the satellite to deliver the "Train the Trainer Program" and programs on commercial general liability issues and other product or process training. The system is not being limited to solely management and business skills training.

DMP: Bill, where do you see Aetna and industry's use of technology moving?

WM: When I came here three and a half years ago, the company had started moving toward the use of direct broadcast satellite. I think Kathryn would agree that the 0-60 analogy is even a bit tame. To show the readers the magnitude of it, when you talk about ten to eleven courses, with one or two or possibly three modules each, that is the equivalent of designing and delivering two programs a month next year. Considering all that is included: pre-work, registration for each course or for each of the modules, any homework that has to be processed or analyzed, all of the production time, it is the equivalent of being a public TV station for a year. It is also one piece, and does not include other demands on the system by our other profit centers. As to the future, I see an increase of more hours and more programming. I see a merger, if you will, a confluence of technologies. As an example, I would like to have some kind of a student response system, if not in every field office, in selective or in rotating field offices for instant student feedback on how we are doing in terms of content and the relationship between the instructor and the student, and for evaluation within a course. Each technology feeds upon the next one. It is not unusual that as we talk about direct broadcast satellite it is appropriately linked with the phone for feedback. I think we are going to see more of a merger of technologies in terms of increasing our ability to reach our employees at real time, with real information, at a reasonable cost.

DMP: Bill, are other corporations moving in the same direction as Aetna?

WM: I think they are accepting the same challenge. I know by reading a few periodicals the number of corporations that are going into the direct broadcast satellite is growing. I would like to think that industry is being guided, not simply producing programs because it is expedient and reasonable in cost terms, but because it provides quality education to adult employees so they can do what are increasingly more complex jobs. We need to respect and address adult learning principles and respect the wide variety of mediums. We need to make the kind of merger that provides an outcome that is going to support both economic growth and the well-being of companies, and make people bright and responsibly trained employees.

Dawn Middleton-Paradise

INTERVIEWS

IBM's View of Distance Education: Speaking Personally with Susan Leslie, Dick Scott, and James Tomsic of IBM.

IBM is committed to distance education, offering educational experiences for IBM employees, business partners, and customers. Susan Leslie, Dick Scott, and James Tomsic play distinct roles in IBM's planning and delivery of educational programs over a distance. As Education Coordinator, Leslie works for the Insurance Industry Marketing group and is responsible for educational curriculum. Scott, a consultant on the corporate education staff in Armonk, New York, works with a department responsible for the formulation of strategic direction for internal and customer education on a worldwide basis. Tomsic, Manager of Satellite Systems for IBM U.S. education, works with the physical facilities of IBM's education networks.

This interview deals with IBM's history and present involvement in distance education. Discussion focuses on IBM's education networks, current distance education programs in their developing stages, and IBM's evaluation of in-house distance education programs. Insights relative to the changing workforce of the future and an outline of the role IBM will assume in addressing issues of educating the workforce of the year 2,000, provide a glimpse of IBM distance education programming in the years to come.

LL: Jim, how did distance education evolve at IBM?

JT: In the late 1970s, in response to the need to increase the number of learners being served by an educational program without having to construct additional office buildings with large auditoriums, we put interactive television facilities in Chicago and New York. Educational programs were conducted independently within each of the two cities. On a single floor of a building we were able to offer a program to 120 learners who were divided into a series of small classrooms with eight to twelve students in a room. These small studios were cabled together, and an instructor facilitated learning over television and video tape players. The same message was broadcast to a large number of students, who didn't feel the impersonal approach of auditorium-style lecturing.

In 1982 we decided to further increase the size of our "classroom" by putting broadcast up on satellite. We did a pilot between the New York and Chicago studios and got very acceptable results. This led to the Interactive Satellite Education Network (ISEN), which is now installed in twenty cities across the country.

LL: When did ISEN actually begin?

JT: That network was begun in 1983, with the first broadcast coming out of New York. Today we have broadcast facilities in New York City, Washington, D.C., Chicago, and Los Angeles, with the capability of four simultaneous broadcasts. And in each of the twenty locations where we have ISEN facilities, each city is capable of receiving two of the four simultaneous broadcasts.

LL: What is the background of IBM's Corporate Education Network (CENET), and what are the technologies IBM uses?

JT: The advent of CENET was 1987. CENET was IBM's response to the question, "How can we offer instruction to IBM lab and plant people across the nation?" CENET is an international network located in twenty-seven cities in the U.S.A., as well as Toronto, Canada. We use a digitizing compression technique to produce cost effective educational programming. This technology allows us to cut down on the amount of satellite time we buy. With CENET, eight studios can have eight simultaneous broadcasts, all of which are located on one piece of a satellite. ISEN, in turn, has all four of its broadcasts on a part of another satellite.

LL: Jim, what specific programs are currently under development in distance education at IBM?

JT: One near-term project I'm looking at right now is adding the capability for students to do hands-on lab work using both the CENET and ISEN networks. Today, most of our classes do not involve a hands-on learning experience; the typical instructional format involves a teacher lecturing about a product, verbally walking the students through the theory of how a product will function. Following the class it is up to students to go back and directly apply what they've "learned" during the broadcast. The near-term project is to add PS/2 equipment to the configuration so that students can do actual practical exercises as a part of the course while it is being taught.

LL: Dick, how are the characteristics of the workforce changing, thereby prompting development in educational programming at IBM?

DS: We're anticipating a significant change in the workforce characteristics. We have summarized these into six "drivers" which we anticipate will change both the content as well as the way education is delivered. First, we believe that there will be a much more diverse student base, particularly with regard to age and culture. This will result in a combination of diverse people working in the same function, perhaps on the same team, and most certainly within the same organization. As well, we see a diverse skill group where units of work or projects will be performed by more of a team organization, as opposed to a hierarchical organization. On any given team you may expect to find people who are novice as well as those who are experts in specific skills, all working together toward a common project goal.

We see a continuous and rapidly increasing need for changing and updating skill requirements. New technologies are being introduced much more frequently; the uses of these technologies are expanding, creating the need for a continuous learning process within the job site.

Also, we see a need for flexibility in work schedules as well as flexibility in work locations. Some work teams of the future will be international in scope, and certainly the nine-to-five Eastern Daylight Time workday will not provide for effective communication with a team member who might be in Tokyo, Sidney, or a European city.

The final driver is the vastly increasing amount of information—what some refer to as the "information overload." The workforce of the next century will require a means of sorting through all available information in order to easily and quickly summarize and capture that information so that it can be used to solve immediate problems.

Considering this set of workforce characteristics, it is our belief that job skills will be more complex and continually changing from a technical standpoint. Creative problem solving, effective team work, organizational effectiveness, and project management will all be crucial to the workforce of the year 2,000. Perhaps the most vital skill—learning to learn new skills or one's ability to continuously update and enhance existing skills—will be critical to the workforce of the year 2,000.

LL: Learning how to learn is a concept which many facilitators of adult distance education work with. It's interesting to learn that IBM is not only cognizant of the importance of lifelong learning, but also encouraging it and factoring it into educational programming. Dick, based upon the projections you cited, what seem to be the major training issues facing IBM and the use of distance education programs in addressing those issues?

DS: Changing skill requirements mandate that education must be quickly accessible to a large number of people on a vast geographic basis. This is a worldwide training issue. The only way for IBM to effectively address the issue is through the use of what we are calling "distributed education." To deal with the diverse skill and student bases, education should be more modular, non-linear, and take advantage of multisensory capabilities. We think distance education is best suited to achieve those results.

Finally, it will be important for IBM's educational offerings to be portable. An employee should be able to take advantage of the programs being offered regardless of the host site of the instruction. Again, distance education is best suited to meet this need.

LL: We've discussed systems and programs; now let's shift our focus to the learners. Susan, what is the IBM employee response to distance education?

SL: From the learner point of view there is increasing acceptance of distance education, specifically the idea of having various approaches to distance education. Economic conditions have a greater and growing effect on the time it takes to do the marketing job, and IBM employees do not want to spend time out of their territory and away from their accounts to participate in an educational experience. IBM is very sensitive to this employee need, and distance education is the appropriate response to meeting educational needs.

As far as the rest of the staff is concerned, the same thing holds true. We have to be more and more productive to successfully meet the challenges of the worksite, and this means we are less and less willing to spend time away from work locations. We're as sensitive to making good use of our educational time as we are to time applied to job tasks. This means that when we are involved in an educational experience we want to learn only what we need to know—there are a lot of interesting, nice things to know about, but if we don't need the information to perform better in our jobs, we'd rather pick it up in our leisure time. We have a strong need to learn those things that will help us do our job better today. We refer to this as "point of need, time of need," and employees have come to appreciate the way distance education fits into that learning approach. The necessity of some classroom offerings is not excluded from the curriculum. I think it is important to have a balance in the overall total curriculum and we strive to look at those instances where distance education is the best mode of instruction, without discounting the possibility of a traditional classroom approach.

LL: Is there a learner favored delivery media?

SL: One of the forms of distance learning that my group has not made extensive use of, but which seems to be very popular among other employee groups, is the audio tape. Employees are receptive to this medium because we're a commuting population, and we can pop a cassette tape into the tape player in the car and learn while traveling to and from customer locations, as well as the home-to-work route.

LL: How are IBM's distance education programs evaluated, and what do evaluations reveal?

JT: When we compare courses that are delivered in the traditional classroom setting to those we deliver over satellite, the two delivery modes run neck and neck in terms of overall learner satisfaction. Evaluation reveals no aversion to the distance education media; there is no learner aversion to the absence of an instructor in the classroom. Not only is learner feedback positive, but results from studies indicate how well students cognitively develop in the distance education environment. Studies show only one or two points difference, and sometimes the difference is a point or two higher for learning over the satellite-delivered programs. When we ask students the question "Do you like this method of learning?" and when we look at actual test scores of learners in the distance education classrooms, we're getting favorable responses from both.

SL: I'd like to add that learners who use our INFOWINDOW study courses also respond very positively to distance education.

LL: What is INFOWINDOW?

SL: INFOWINDOW is IBM's hardware/software system for delivering interactive videodisk/computer based training; it's our level three interactive video disk education system. As part of the program, guided learning centers routinely require students to fill out evaluation forms. We, the owners of the courses, have access to the responses on these forms, which show that learners are highly receptive to the courses.

In addition to student input, we also give strong consideration to the feedback of our branch managers regarding education courses. We see branch management as a customer of our educational offerings, and it's important that management is satisfied with the education received by their employees, to help the corporation meet its business objectives. We approach education like we would any other business activity—it must support the corporate goals.

LL: Dick, in closing, how do you see distance education at IBM fitting into the competitive corporate world of the future?

DS: First, we need to remember that all of us in education at IBM have the responsibility to ensure that the development and delivery of educational offerings and learning are of the highest quality, cost effective, and designed to enhance the skills and competitiveness of IBM human resources. In an effort to accomplish these things, we are using distance education as a tool for enhancing the student/instructor ratio, as well as leveraging the expense dollars from travel and time devoted to education. Distance education enables us to move toward self-directed learning, and set-up the learning environment within the work place. Adult learning theories that we have considered, coupled with the pressures of the workday's time schedule, point to distance education as the best means of adjusting time devoted to education with the right student, in the right class, at the point of need, and in a cost effective, quality manner.

Additionally, I think we are on the verge of some major break-throughs in multi-media technology, in communications technology, and memory, storage, and screen technology. This is an exciting time when corporate competitiveness is at a global dimension, with a workforce that is in constant need of upskilling and continuous learning,which are both available through the technologies just mentioned. This makes the role of the education professional more important than it has been at any time in history. Certainly the challenges are great, but the technologies are developing at a time when we can most benefit from the very exciting and significant contributions that distance education can make to the competitiveness of human resources in the coming decades.

Lauren K. Lukert

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